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NEW SPECIES AND RECORDS OF *AGATHIDIUM* FROM MALAYSIA (MALAYA) AND THE PHILIPPINES (COLEOPTERA: LEIODIDAE)

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ABSTRACT

Five new species of *Agathidium* from Malaysia (Malaya) are described and illustrated: *Agathidium watrousi,* n. sp.; *A. wheeleri,* n. sp.; *A. pseudoscutellare,* n. sp.; *A. rougemonti,* n. sp.; and *A. pahangense,* n. sp. Additional collecting data are given for four other Malayan species of *Agathidium* and for two Philippines species. The spermathecae of *A. angelinii* Cooter and *A. cooteri* Angelini and De Marzo are figured. A key to the species from Malaya is presented.

Thanks to the courtesy of Dr. Quentin Wheeler and Dr. G. M. de Rougemont, I have obtained 96 specimens representing 9 species of *Agathidium* from Malaysia (Malaya) and 2 species from the Philippines; these were collected by Dr. L. E. Watrous or Dr. G. M. de Rougemont. This material includes (a) five new species from Malaysia and (b) the females of *Agathidium angelinii* Cooter and *A. cooteri* Angelini and De Marzo (only males were previously known). The spermathecae of the latter two species are illustrated. Finally a key to the 13 species now known from Malaya is presented.

The specimens are deposited in the Cornell University Collection (CUIC) and the F. Angelini Collection (FACC). In the descriptions, W = width, L = length, and H = height.

KEY TO THE *AGATHIDIUM* KNOWN FROM MALAYA

1. Head comparatively large, ratio of width of pronotum/head = 1.16–1.50, higher in rare instances; clypeal line unbroken or absent ..... subg. *Agathidium, s. str.* 2
– Head comparatively small, ratio of width of pronotum/head = 1.6–2.1; clypeal line broken medially, reduced to an oblique crest on each side of clypeus, more or less long, sometimes the clypeal line unbroken and very marked ..... subg. *Microceble* Angelini and De Marzo 10
2(1). Meso- and metacoxae separated; anterior margins of head at sides of clypeus with strong raised line 3
– Meso- and metacoxae touching; anterior margins of head at sides of clypeus with fine strong raised line 5
3(2). Entire dorsum without microreticulation. Dorsum reddish-brown, with fine, regular punctation; antennae testaceous with 9th and 10th segments darker, ratio of 3rd/2nd segments = 1.2; length 2.75 mm ..... *hlisnikovskyi* Angelini and De Marzo
– Dorsum of head and pronotum with microreticulation, elytra smooth 4

4(3). Head and pronotum equally microreticulate; male copulatory organs (Figs. 9, 10); spermatheca (Fig. 13). Dorsum darker reddish-brown or black, with fine sparse punctation; antennae testaceous with 9th and 10th segments darker, ratio of 3rd/2nd segments = 1.7 (Fig. 1); male hind femur (Fig. 7); length 3.05–3.15 mm ____ *watrousi*, n. sp.

– Dorsum of head with microreticulation more superficial than that of pronotum; male copulatory organ (Figs. 11, 12); spermatheca (Fig. 14). Dorsum dark reddish-brown or black, with fine, sparse punctation; antennae testaceous with 9th and 10th segments darker, ratio of 3rd/2nd segments = 1.5 (Fig. 2); male hind femur (Fig. 8); length 2.6–2.8 mm ____ *wheeleri*, n. sp.

5(2). Clypeus not emarginate, ending in a point (Fig. 17). Dorsum uniformly reddish-brown, microscopically punctured; antennae testaceous, ratio of 3rd and 2nd segments = 0.7 (Fig. 23); habitus (Figs. 24, 25); male femur (Fig. 26); male copulatory organ (Figs. 31, 32); length 1.75 mm ____ *pseudoscutellare*, n. sp.

– Clypeus emarginate (Fig. 19) ____ 6

6(5). Head widest behind eyes; pronotum and elytra with some long setae. Dorsum reddish-brown, entirely without microreticulation, but head and pronotum with very small punctures; antennae testaceous, ratio of 3rd and 2nd segments = 1.0; length 1.90–1.95 mm ____ *pilosellum* Angelini and De Marzo

– Head widest at eyes; pronotum and elytra glabrous or with sparse and short setae ____ 7

7(6). Pronotum and elytra with distinct and regular punctation; male hind femur with strong subdistal tooth; dorsum uniformly black or reddish-brown, entirely without microreticulation; antennae testaceous, ratio of 3rd and 2nd segments = 1.0; length 2.05–2.55 mm ____ *malaysicum* Angelini and De Marzo

– Pronotum with very small punctures, elytra impunctate; male hind femur without tooth at posterior margin ____ 8

8(7). Lateral outline of pronotum broadly rounded; dorsum uniformly black; antennae testaceous, ratio of 3rd and 2nd segments = 1.0; length 2.40–2.55 mm ____ *jaccoudi* Angelini and De Marzo

– Lateral outline of pronotum nearly angulate ____ 9

9(8). Antenna with 3rd segment nearly as long as 2nd. Dorsum uniformly reddish-brown, entirely without microreticulation; antennae testaceous; length 2.20–2.35 mm ____ *malayanum* Angelini and De Marzo

– Antenna with 3rd segment clearly longer than 2nd (ratio = 2.1) (Fig. 27). Dorsum uniformly dark and without microreticulation; antennae testaceous; male hind femur (Fig. 30); male copulatory organ (Figs. 33, 34); spermatheca (Fig. 35); habitus (Figs. 28, 29); length 2.1–2.6 mm ____ *rougemonti*, n. sp.

10(1). Raised clypeal line not interrupted at middle. Dorsum uniformly reddish-brown, with fine and sparse punctuation; antennae testaceous, ratio of 3rd and 2nd segments = 0.8; length 2.5 mm ____ *pileti* Angelini and De Marzo

– Raised clypeal line interrupted at middle, reduced to two short lateral lines ____ 11

11(10). Pronotum with microreticulation. Dorsum black with apex of

elytra reddish-brown; head and pronotum with distinct and regular punctation, fine and sparse on elytra; antennae testaceous with 9th and 10th segments darker or black, ratio of 3rd and 2nd segments = 1.1; male hind femur (Fig. 39); male copulatory organ (Figs. 40–42); spermatheca (Fig. 43); length 2.6–3.0 mm ——— *pahangense*, n. sp.

– Pronotum without microreticulation ——— 12

12(11). Dorsum of head entirely microreticulate. Dorsum uniformly black or dark reddish-brown rarely with pronotal disc and elytral sides reddish-brown, punctation fine and distinct; antennae each with darker club, ratio of 3rd and 2nd segments = 1.7; length 3.0–3.3 mm ——— *laticorne* Portevin

– Head with microscopic wrinkles anteriorly between oblique grooves on either side of clypeus; dorsum dark reddish-brown, punctation sparse on entire dorsum; antennae testaceous, ratio of 3rd and 2nd segments = 1.05; length 2.60–2.85 mm ——— *saundersi* Angelini and De Marzo

AGATHIDIUM FROM MALAY (MALAYSIA)

Agathidium (*s. str.*) *watrousi* Angelini, **n. sp.**
(Figs. 1, 3, 4, 7, 9, 10, 13, 15, 16)

DESCRIPTION. Length 3.05–3.15 mm (holotype ♂ 3.1 mm). Dorsum uniformly dark reddish-brown or black; venter reddish-brown, paler at mesosternum; antennae testaceous with 9th and 10th segments darker; legs reddish-brown. Entire dorsum with clear and sparse punctation.

Head: Microreticulation superficial and uniform; punctures moderately large, impressed, separated by 2–4 times their own diameters. Clypeal line absent; anterolateral margins with raised line. Antenna with 3rd segment 1.7 times as long as 2nd segment and as long as 4th + 5th (Fig. 1); Hamann's organ: gutter with one vesicle in both 9th and 10th segments.

Pronotum: Microreticulation superficial and uniform; punctures larger and more impressed than those on head, separated by 1–5 times their own diameters; 1.7 times as broad as head, not very transverse (W/L = 1.25) and very convex (W/H = 1.27); anterior margin slightly emarginate (Fig. 3), lateral outline very broadly rounded (Fig. 4). Holotype: length 1.12 mm, width 1.40 mm, height 1.10 mm.

Elytra: Not microreticulate; punctures larger and more impressed than those on pronotum, separated by 1–4 times their own diameters; a little broader than pronotum, nearly as broad as long (W/L = 1.07) and moderately convex (W/H = 1.6); lateral outline with weak humeral angle; sutural striae absent. Holotype: length 1.35 mm, width 1.45 mm, height 0.90 mm.

Venter: Metathoracic wings present, ⅔ length of elytra. Meso- and metasternum with median carina present, lateral lines absent, femoral lines incomplete, rounded at middle. Male hind femur simple (Fig. 7). Tarsal formula ♂ 5-5-4, ♀ 5-4-4.

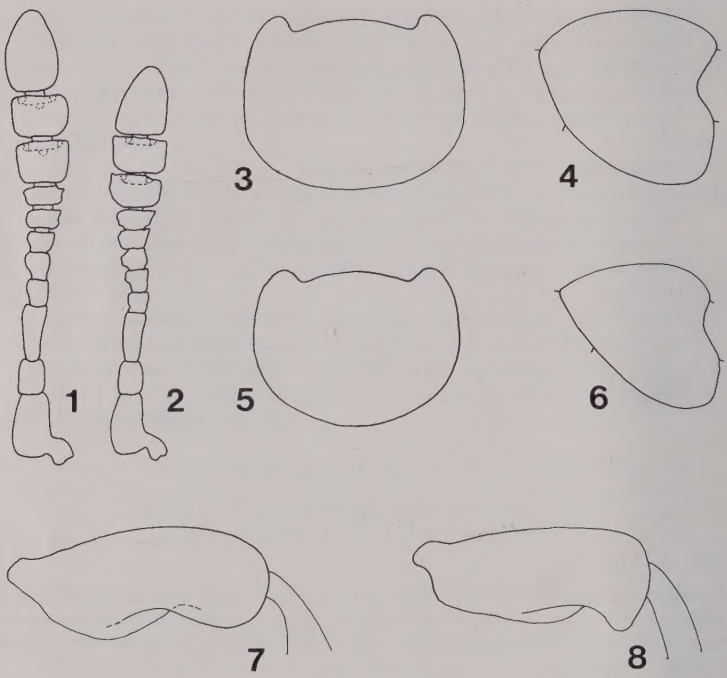
Male copulatory organ (Figs. 9, 10): Aedeagus slender, with twisted proximal part, lateral margins gently convergent, truncate apex, bifid ventral piece; parameres slender, rounded at apex.

Spermatheca (Fig. 13): Apical part very slender, basal part subspherical.

TYPE MATERIAL. Holotype ♂: Malaysia, Malaya, Pahang, 19 mi. NE Kuala Lumpur, 28.IV.1977, leg. L. E. Watrous, N.6351 in CUIC.

Paratypes: same collecting data as holotype, 1 ♂, N.6352 in FACC; 29.IV.1977, 1 ♀, N.6353 in CUIC.

DISTRIBUTION. Malaysia (Malaya).



Figs. 1–8. *Agathidium,* n. spp. 1, 3, 4, 7, *A. watrousi*; 2, 5, 6, 8, *A. wheeleri.* 1, 2, antenna; 3–6, pronotum, dorsal view (3, 5) and lateral outline 3–6; 7, 8, male hind femur.

COLLECTING METHODS. Berlese leaf litter and rotten figs along stream.

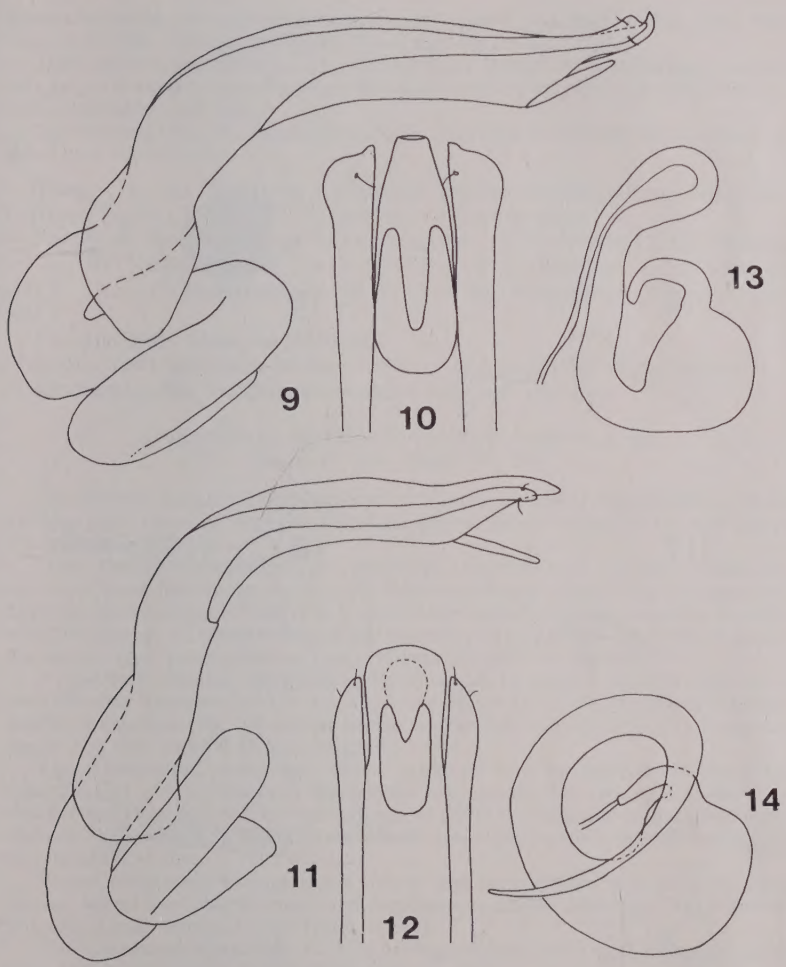
DISCUSSION. *Agathidium watrousi* and *A. wheeleri* differ from all species with raised anterolateral margins of head by the presence of the microrecticulation on the dorsum of the head and pronotum. In *A. watrousi* the head and pronotum are equally microreticulate and the male copulatory organ (Figs. 9, 10) is different, whereas in *A. wheeleri* the head is more superficially microreticulate than the pronotum and the male copulatory organ (Figs. 13, 14) are shaped differently.

Agathidium (*s. str.*) *wheeleri* Angelini, **n. sp.**
(Figs. 2, 5, 6, 8, 11, 12, 14)

DESCRIPTION. Length 2.60–2.80 mm (holotype ♂ 2.75 mm). Dorsum dark reddish-brown or black, venter reddish-brown, antennae testaceous with 9th and 10th segments darker, legs reddish-brown. Head and pronotum with superficial and uniform microreticulation; entire dorsum with fine and sparse punctation.

Head: Microreticulation very superficial and uniform, punctures small and superficial, separated by 1–5 times their own diameters. Clypeal line absent, anterolateral margins with raised line. Antenna with 3rd segment 1.5 times as long as 2nd segment and longer than 4th + 5th (Fig. 2); Hamann's organ: gutter without vesicles in both 9th and 10th segments.

Pronotum: Microreticulation superficial and uniform, more impressed than that on head, punctures similar to those on head except separated by 1–4 times their own

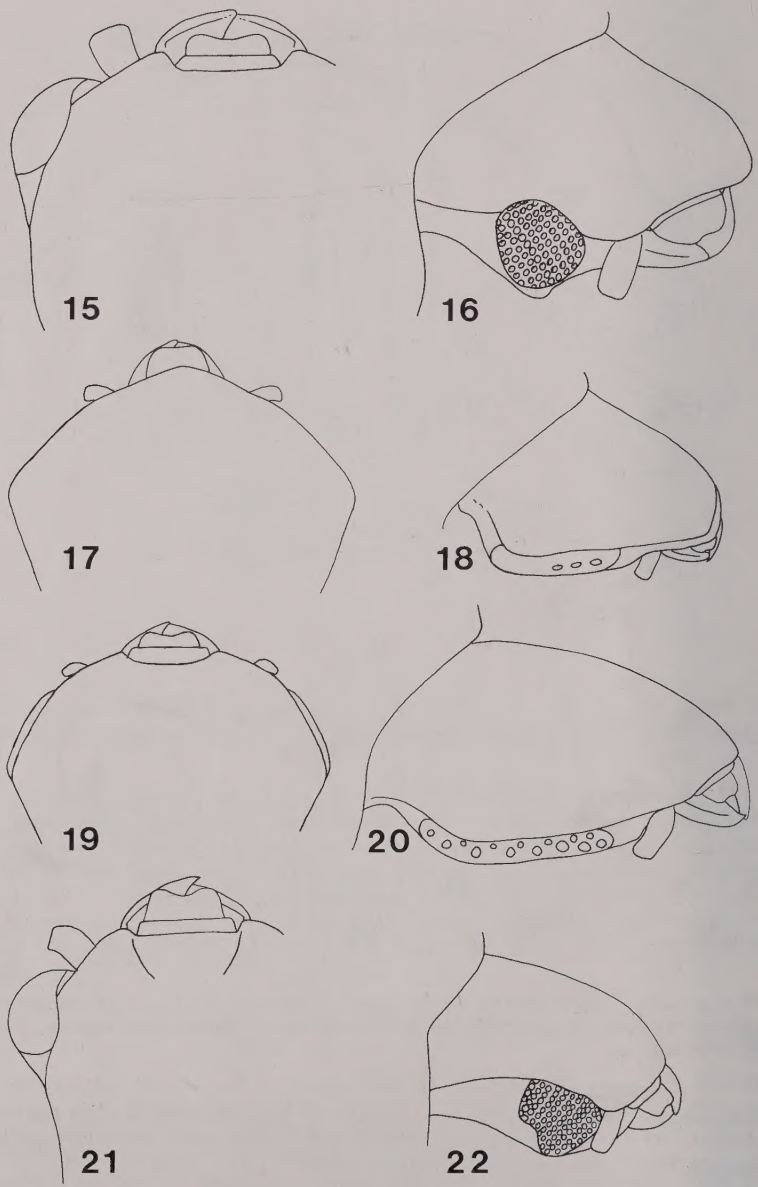


Figs. 9–14. *Agathidium*, n. spp. 9, 10, 13, *A. watrousi*; 11, 12, 14, *A. wheeleri*. 9–12, male copulatory organ (9, 10, lateral view and 10, 12, ventral view of apex); 13, 14, spermatheca.

diameters; 1.7 times as broad as head, moderately transverse (W/L = 1.30) and very convex (W/H = 1.44); anterior margin slightly bent (Fig. 5); lateral outline very broadly rounded (Fig. 6). Holotype: length 1.00 mm, width 1.30 mm, height 0.76 mm.

Elytra: Not microreticulate, punctures double in size those on head and more impressed, separated by 1–6 times their own diameters; as broad as pronotum, moderately broader than long (W/L = 1.13) and moderately convex (W/H = 1.52), lateral outline with weak humeral angle, sutural striae absent. Holotype: length 1.15 mm, width 1.30 mm, height 0.85 mm.

Venter: Metathoracic wings present. Meso- and metasternum with median carina



Figs. 15–22. *Agathidium*, n. spp. 15, 16, *A. watrousi*; 17, 18, *A. pseudoscutellare*; 19, 20, *A. rougemonti*; 21–22, *A. pahangense*; 15, 17, 19, 21, head (dorsal view); 16, 18, 20, 22, head (lateral outline).

present, lateral lines incomplete, femoral lines incomplete, rounded in middle. Male hind femur with weak distal tooth (Fig. 8). Tarsal formula ♂ 5-5-4, ♀ 5-4-4.

Male copulatory organ (Figs. 11, 12): Aedeagus slender, with spiral-like proximal part, lateral margins sinuate, broadly rounded tip, bifid ventral piece. Parameres slender, gently tapered towards apex.

Spermatheca (Fig. 14): Basal part globose, with long tubercle at duct connection, apical part very slender.

TYPE MATERIAL. Holotype ♂: Malaysia, Malaya, Pahang, 19 mi. NE Kuala Lumpur, 28.IV.1977, leg. L. E. Watrous, N.6354 in CUIC.

Paratypes: same collecting data as holotype, 1 ♀ N.6355 in CUIC. Pahang, 15 mi. NE Kuala Lumpur, 19.IV.1977, leg. L. E. Watrous, 1 ♂ N.6356 in FACC. Cameron Highlands, 25–30.III.1984, leg. Rougemont, 1 ♀ N.6357 in FACC.

DISTRIBUTION. Malaysia (Malaya).

COLLECTING METHODS. Berlese leaf litter and rotten figs along stream.

DISCUSSION. See the Discussion above under *A. watrousi.*

Agathidium (*s. str.*) *pseudoscutellare* Angelini, **n. sp.**
(Figs. 17, 18, 23–26, 31, 32)

DESCRIPTION. Length 1.75 mm (holotype ♂). Dorsum uniformly reddish-brown, venter and legs paler, antennae testaceous. Dorsum without microreticulation, but with sparse microscopic punctation.

Head: Punctures microscopic and superficial, separated by 5–8 times their own diameters. Clypeal line absent, clypeus not emarginate, ending in point (Fig. 17). Eyes very flattened; lateral outline of head (Fig. 18); eye composed of only three omatidia. Antenna with 3rd segment 0.7 times as long as 2nd segment and longer than 4th + 5th (Fig. 23); Hamann's organ: gutter with one vesicle in both 9th and 10th segments.

Pronotum: Punctation microscopic, similar to that on head; 1.18 times as broad as head, not very transverse (W/L = 1.25) and very convex (W/H = 1.31); anterion margin strongly emarginate (Fig. 24), lateral margin very broadly rounded (Fig. 25). Holotype: length 0.66 mm, width 0.83 mm, height 0.63 mm.

Elytra: Punctation microscopic, similar to that on head, but more sparse, punctures separated by 2–10 times their own diameters; a little broader than pronotum, moderately broader than long (W/L = 1.36) and very convex (W/H = 1.4); lateral outline with strong humeral angles (Fig. 25); sutural striae absent. Holotype: length 0.66 mm, width 0.90 mm, height 0.64 mm.

Venter: Metathoracic wings absent. Meso- and metasternum with median carina present, lateral lines absent (meso- and metacoxae touching). Male hind femur simple (Fig. 26). Tarsal formula ♂ 4-4-4 (♀ not known).

Male copulatory organ (Figs. 31, 32): Aedeagus slender, with hook-like piece indistinct. Parameres slender, gently tapering towards apex.

TYPE MATERIAL. Holotype ♂: Malaysia, Malaya, Pahang, 15 mi. NE Kuala Lumpur, 19.IV.1977, leg. L. E. Watrous, N.6358 in CUIC.

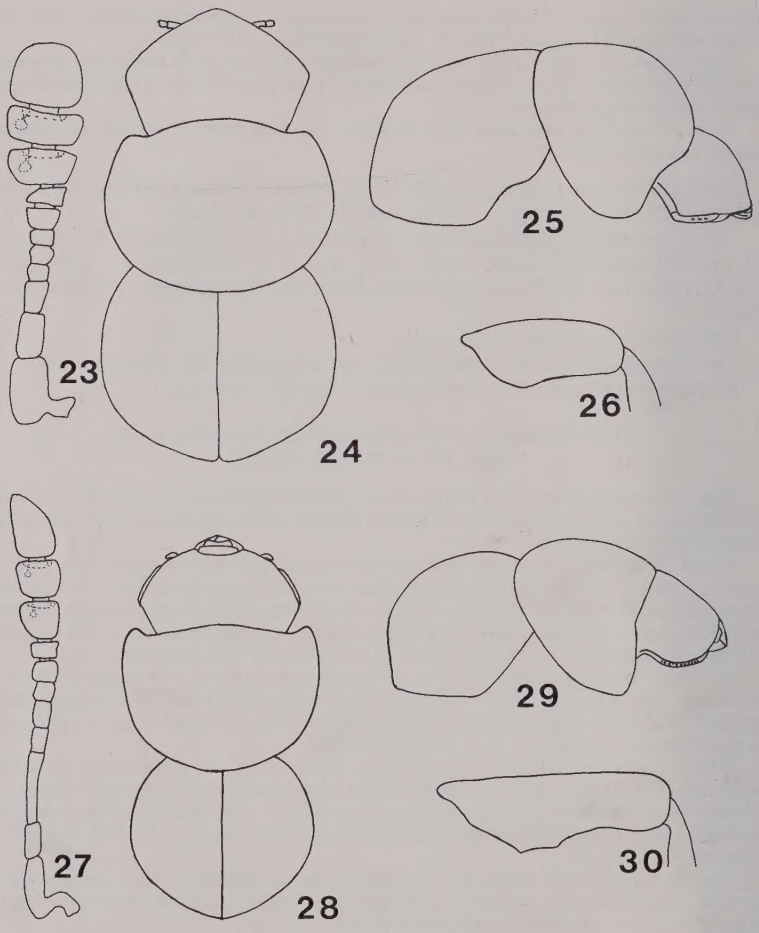
DISTRIBUTION. Malaysia (Malaya).

COLLECTING METHODS. Berlese leaf litter along stream.

DISCUSSION. *Agathidium pseudoscutellare* is very similar in habitus and other external characters to *A. scutellare* Angelini and De Marzo from Thailand, particularly in having the clypeus produced anteriorly to a point (these are the only two species of *Agathidium* known with this character); the species differs from *A. scutellare* only by the smaller size and the shape of the aedeagus.

Agathidium (*s. str.*) *pilosellum* Angelini and De Marzo 1986*a*:424

MATERIAL. Malaysia, Malaya, Pahang, 4 mi. NE Cameron Highlands, 24.IV.1977 (1 ex.), leg. L. E. Watrous, in CUIC.



Figs. 23–30. *Agathidium,* n. spp. 23–26, *A. pseudoscutellare*; 27–30, *A. rougemonti.* 23, 27, antenna; 24, 28, habitus (dorsal view); 25, 29, habitus (lateral view); 26, 30, male hind femur.

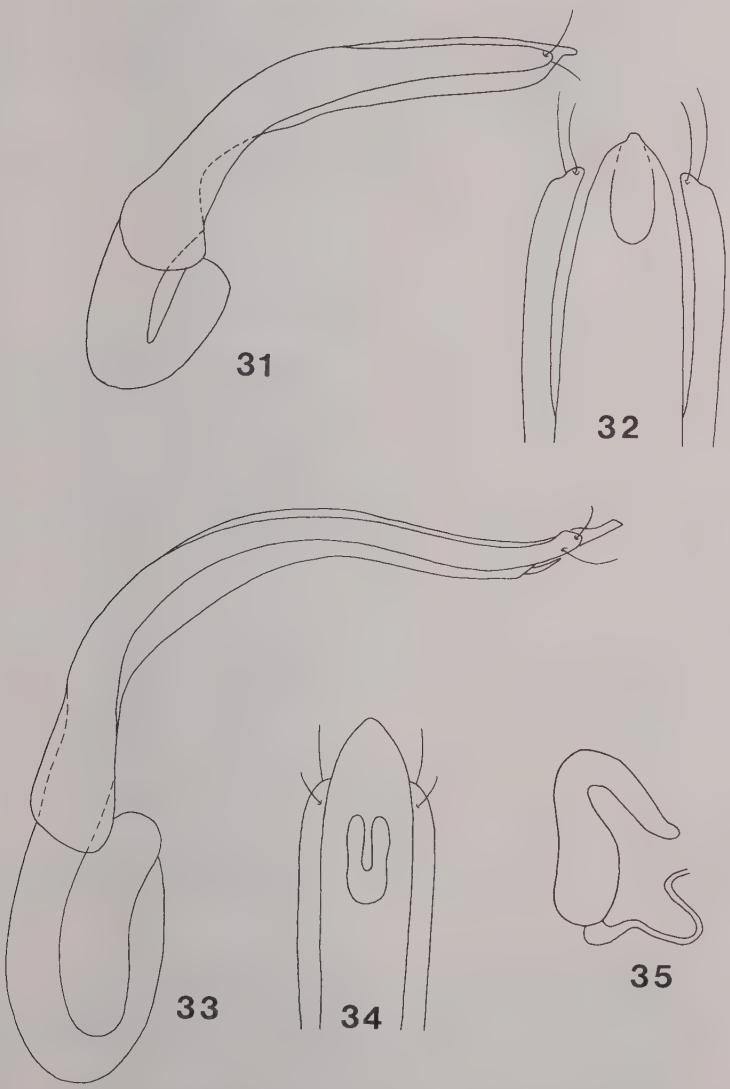
DISTRIBUTION. Malaysia (Malaya).

COLLECTING METHODS. Berlese mixed hardwood litter.

DISCUSSION. The above specimen agrees in all characters with the types. Length range: 1.90–1.95 (holotype) mm.

Agathidium (*s. str.*) *malaysicum* Angelini and De Marzo 1986*a*:426

MATERIAL. Malaysia, Malaya, Pahang, 4 mi. NE Cameron Highlands, 24.IX.1977 (3 exx.), 25.IV.1977 (13 exx.), leg. L. E. Watrous; Pahang, G. Batu, Beringchang, 2,000 m, 24.IV.1977 (7 exx.), leg. L. E. Watrous; all in CUIC and FACC.



Figs. 31–35. *Agathidium,* n. spp. 31, 32, *A. pseudoscutellare*; 33-35, *A. rougemonti.* 31–34, male copulatory organ (31, 33, lateral view and 32, 34, ventral view of apex); 35, spermatheca.

Distribution. Malaysia (Malaya).

Collecting Methods. Berlese mixed hardwood litter and in swampy area.

Discussion. The color of the dorsum is, generally, reddish-brown, rarely black; the punctation is similar to that of the types. Length 2.05–2.55 mm.

Agathidium (*s. str.*) *jaccoudi* Angelini and De Marzo 1986*a*:429

MATERIAL. Malaysia, Malaya, Pahang, G. Batu, Berinchang, 2,000 m, 24.IV.1977 (1 ex.), leg. L. E. Watrous, in CUIC.

DISTRIBUTION. Malaysia (Malaya).

COLLECTING METHODS. Berlese damp leaf litter.

DISCUSSION. The new specimen is similar in color, punctation, and length to the types.

Agathidium (*s. str.*) *rougemonti* Angelini, **n. sp.**
(Figs. 19, 20, 27–30, 33–35)

DESCRIPTION. Length 2.10–2.60 mm (holotype ♂ 2.50). Dorsum uniformly black, venter and legs reddish-brown, antennae testaceous. Entire dorsum without microreticulation and punctation.

Head: Clypeal line absent. Eyes very long and flattened (Fig. 19); lateral outline of head as in Figure 20; eyes composed of a lower line of eight larger and an upper line of six smaller ommatidia. Antenna with 3rd segment 2.1 times as long as 2nd segment (Fig. 27); Hamann's organ: gutter with one vesicle in both 9th and 10th segments.

Pronotum: 1.2 times as broad as head; moderately transverse (W/L = 1.41) and very convex (W/H = 1.24); anterior margin slightly emarginate (Fig. 28); lateral outline nearly angulate (Fig. 29). Holotype: length 0.90 mm, width 1.27 mm, height 1.02 mm.

Elytra: With short superficial and irregular furrows; slightly narrower than pronotum, somewhat broader than long (W/L = 1.35), very convex (W/H = 1.24), lateral outline with strong humeral angles (Fig. 29); sutural striae absent. Holotype: length 0.87 mm, width 1.18 mm, height 0.95 mm.

Venter: Metathoracic wings absent. Meso- and metasternum with median carina present, lateral lines absent, femoral lines absent (meso- and metacoxae touching). Male hind femur simple (Fig. 30). Tarsal formula ♂ 4-4-4, ♀ 4-4-4.

Male copulatory organ (Figs. 33, 34): Aedeagus slender with spiral-like proximal part, lateral margins gently convergent into rounded tip, bifid ventral piece. Parameres slender, gently tapering towards apex.

Spermatheca (Fig. 35): Apical part slender, gently tapered towards apex; basal part rather robust.

TYPE MATERIAL. Holotype ♂: Malaysia, Malaya, Cameron Highlands, 25–30.III.1984, leg. Rougemont, N.6359, in FACC.

Paratypes: Same collecting data as holotype, 4 ♂♂, 3 ♀♀ N.6360–6366, in FACC. Malaya, Pahang, 4 mi. NE Cameron Highlands, 24.IV.1977, leg. L. E. Watrous, 1 ♂, 6 ♀♀ N.6367–6372, 6380 in CUIC, 2 ♂♂, 2 ♀♀, N.6373–6376 in FACC.

DISTRIBUTION. Malaysia (Malaya).

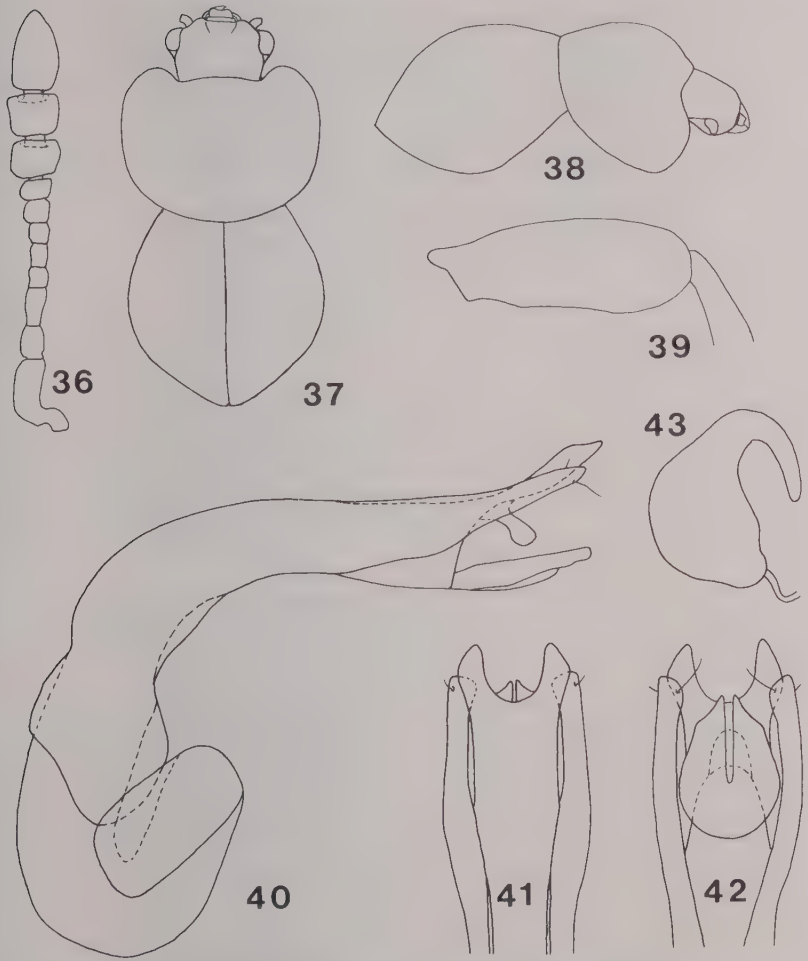
COLLECTING METHODS. Berlese mixed hardwood litter.

DISCUSSION. *Agathidium rougemonti* is very similar in habitus and other external characters to *A. malayanum*; it differs in the ratio of the length of 3rd/2nd antennal segments and in male copulatory organ.

Agathidium (*Microceble*) *pahangense* Angelini, **n. sp.**
(Figs. 21, 22, 36–43)

DESCRIPTION. Length 2.60–3.00 mm (holotype ♂ 2.65). Dorsum black, apex of elytra reddish-brown, venter reddish-brown, mesosternum testaceous, antennae testaceous with 9th and 10th segments darker or black, legs reddish-brown. Head and pronotum with superficial and uniform microreticulation, in traces on elytra; head and pronotum with clear punctation, more fine and sparse on elytra.

Head: Microreticulation superficial and uniform, microsculptured near clypeal margin; punctures moderately large and impressed, separated by 1–5 times their own di-



Figs. 36–43. *Agathidium pahangense,* n. spp. 36, antenna; 37, 38, habitus (dorsal view and lateral outline); 39, male hind femur; 40–42, male copulatory organ (lateral view and dorsal and ventral view of apex); 43, spermatheca.

ameters. Clypeal line absent, anterior lateral margins distinctly raised; small fovea and short groove at each side of clypeus. Lateral view of head (Fig. 22). Antenna with 3rd segment 1.1 times as long as 2nd segment and longer than 4th + 5th (Fig. 36); Hamann's organ: gutter without vesicles in both 9th and 10th segments.

Pronotum: Microreticulation superficial and uniform, more impressed than that on head; punctures as those on head, separated by 1–10 times their own diameters; 1.88 times as broad as head, moderately transverse (W/L = 1.46) and very convex (W/H = 1.43); anterior margin strongly emarginate (Fig. 37), lateral outline very broadly rounded (Fig. 38). Holotype: length 0.90 mm, width 1.32 mm, height 0.92 mm.

Elytra: Not microreticulate (only traces); punctures as those on head, separated by

4–10 times their own diameters; as broad as pronotum, a little broader than long (W/L = 1.1) and very convex (W/H = 1.46); lateral outline with weak humeral angle (Fig. 38); sutural striae absent. Holotype: length 1.20 mm, width 1.32 mm, height 0.90 mm.

Venter: Metathoracic wings present. Meso- and metasternum with median carina present, lateral lines absent, femoral lines incomplete, rounded at middle. Male hind femur simple (Fig. 39). Tarsal formula ♂ 5-5-4, ♀ 5-4-4.

Male copulatory organ (Figs. 40–42): Aedeagus comparatively stout, with spiral-like proximal part, lateral margins sinuate, enlarged and bifurcate at apex, bifid ventral piece. Parameres slender, rounded at apex.

Spermatheca (Fig. 43): Basal part pear-shaped, apical part slender and short.

TYPE MATERIAL. Holotype ♂: Malaysia, Malaya, Pahang, 19 mi. NE Kuala Lumpur, 28.IV.1977, leg. L. E. Watrous, N.6377 in CUIC.

Paratypes: Same collecting data as holotype, 29.IV.1977, 1 ♀, N.6378 in CUIC; Pahang, 15 mi. NE Kuala Lumpur, 19.IV.1977, leg. L. E. Watrous, 1 ♀ N.6379 in FACC.

DISTRIBUTION. Malaysia (Malaya).

COLLECTING METHODS. Berlese leaf litter and rotten figs and Berlese leaf litter along stream.

DISCUSSION. *Agathidium pahangense* is very similar in habitus and other external characters to *A. darbyi* Angelini and De Marzo and *A. puncticolle* Cooter. It differs from *A. darbyi* by its smaller size and by its head being much smaller relative to the pronotum; it differs from *A. puncticolle* only in the shape of the male copulatory organ.

Agathidium (*Microceble*) *laticorne* Portevin

Agathidium (*Cyphoceble*) *laticorne* Portevin 1922:58.
Agathidium (*Microceble*) *laticorne;* Angelini and De Marzo 1986*a*:42.

MATERIAL. Malaysia, Malaya, Pahang, 30 mi. NE Kuala Lumpur, 19.IV.1977 (1 ex.), leg. L. E. Watrous, in CUIC; 19 mi. NE Kuala Lumpur, 28–29.IV.1977 (6 exx.), leg. L. E. Watrous, in CUIC and FACC.

DISTRIBUTION. Pakistan, Nepal, Bhutan, India, Sri Lanka, Thailand, Viet Nam, Malaysia, and Indonesia.

COLLECTING METHODS. Berlese leaf litter and rotten figs along stream.

DISCUSSION. The color of the dorsum of these new specimens is reddish-brown or black and the pronotum is superficially microreticulate.

AGATHIDIUM FROM THE PHILIPPINES

Agathidium (*Microceble*) *cooteri* Angelini and De Marzo (Figs. 44, 46)

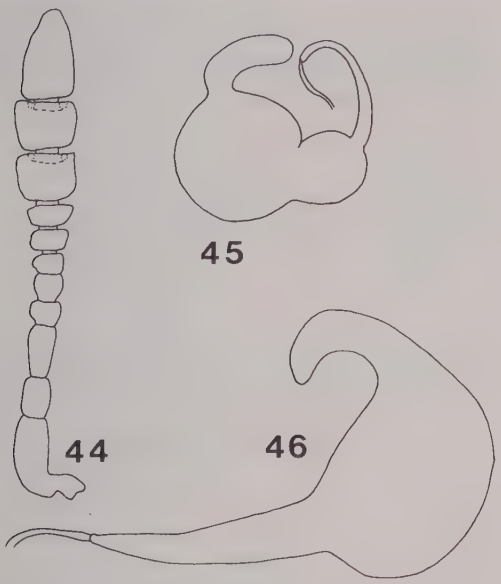
Agathidium (*s. str.*) *cooteri* Angelini and De Marzo 1984:35.
Agathidium (*Microceble*) *cooteri*; Angelini and De Marzo 1986*a*:453.

MATERIAL. The Philippines, laguna 4 km SE Los Banos, Mt. Makiling, 8.IV.1977 (4 exx.), leg. L. E. Watrous, in CUIC and FACC.

DISTRIBUTION. The Philippines.

COLLECTING METHODS. Berlese forest litter.

DISCUSSION. *Agathidium cooteri* was described on the basis of two males, which showed an unusual 4-segmented antennal club; the three new males confirm this antennal character. The single female shows the presence of sexual antennal dimorphism in this species. In fact, the female antenna (Fig. 44) has the usual 3-segmented club, as do most *Agathidium*. This is the second instance



Figs. 44–46. *Agathidium* spp. 44, 46, *A. cooteri* Angelini and De Marzo; 45, *A. angelini*; 44, antenna; 45, 46, spermatheca.

in which the male has a 4-segmented club the female has a 3-segmented club, the first being *A. taru* Angelini and De Marzo (1986*b*:868), furthermore both species belong in the subgenus *Microceble*.

The female characters are: spermatheca (Fig. 46); tarsal formula 5-4-4; length 2.90–3.00; color, punctation and microreticulation fully similar to male types.

Agathidium (*Microceble*) *angelinii* Cooter
(Fig. 45)

Agathidium (*s. str.*) angelinii Cooter 1984:69.
Agathidium (*Microceble*) angelinii; Angelini and De Marzo 1986*a*:453.

Material. The Philippines, Laguna, 4 km SE Los Banos, Mt. Makiling, 9-12.IV.1977 (20 exx.), leg. L. E. Watrous, in CUIC and FACC.

Distribution: The Philippines.

Collecting Methods. Berlese debris under bark, forest litter or mixed hardwood litter.

Discussion. In the above material, the punctation is more or less impressed compared with that of the male holotype, but the color is similar and the length 2.0–2.5 mm.

The female characters: spermatheca (Fig. 45) and tarsal formula 5-4-4.

Acknowledgments

I express my sincere thanks to Dr. Quentin D. Wheeler for the opportunity to study the material collected by Dr. L. E. Watrous in Malaysia (Malaya) and

The Philippines and to Dr. G. M. de Rougemont for the material collected by him in Malaysia (Malaya). Many thanks also to Dr. J. Cooter (Hereford) and Prof. L. De Marzo (Potenza) for suggestions, criticisms, and some of the drawings.

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NEW COLEOPTERIST POSITION AT THE CANADIAN MUSEUM OF NATURE

Dr. Robert S. Anderson was recently appointed as the new Curator of Entomology at the Canadian Museum of Nature (formerly the National Museum of Natural Sciences) in Ottawa. Bob returns to Canada following a two-year NSERC postdoctoral fellowship and a one-year research assistantship at Texas A&M University. His research will focus on the systematics, evolution and biogeography of Curculionidae. Current projects include faunistic studies of the weevils of the Yukon Territory and of south Florida and the weevils associated with Christmas mistletoes (Viscaceae). Plans are currently underway for long-term study of the leaf-litter inhabiting weevils of the New World.

The entomology collection at the CMNS currently houses extensive collections of Coleoptera, especially Curculionidae (largely Bob's personal collection, now on indefinite loan to CMNS), Chrysomelidae, Cerambycidae, Buprestidae (largely from the personal collection of Henry and Anne Howden, now in part deposited at CMNS), as well as a number of smaller families and a large assortment of unsorted Coleoptera from Canada, United States, Chile, Argentina, Australia, South Africa, and various Central American countries. Visitors are welcomed, but please contact Bob in advance. Some funding is available for visits of a curatorial nature. Queries and loan requests are welcomed; write R. S. Anderson, Curator of Entomology, Canadian Museum of Nature, Station D, Ottawa, ON K1P 6P4, Canada.

The Coleopterists Bulletin, 44(3):255–264. 1990.

DESCRIPTION OF THE LARVA OF *CHRISTENSENIA ANTARCTICA* BRINCK WITH IMPLICATIONS FOR THE PHYLOGENY OF ECTEMNORHININI (COLEOPTERA: CURCULIONIDAE)

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Abstract

The final instar larva of *Christensenia antarctica* Brinck from Îles Crozet is described for the first time. Additional information on the larvae of *Canonopsis sericea* C. O. Waterhouse and *Ectemnorhinus grisescens* Enderlein from Heard Island is also provided. Contrary to previous studies, *E. grisescens* has sclerotized labral tormae and 2 + **8** pronotal setae. A preliminary phylogeny of the tribe is provided based on a cladistic analysis of 10 larval characters.

The Ectemnorhinini are a monophyletic group of Entiminae, characterized by one major seta (*fs* 4) on the frons and reduced *fs* 5 setae in the larvae (see tribal description below). Although the adults in the monotypic genera *Canonopsis* C. O. Waterhouse, *Christensenia* Brinck and *Neocanonopsis* Hoffmann possess accessory mandibular cusps and/or the associated scar (personal obser.), the tribe's affinities and/or sister group within the Adelognatha are not clear (Kuschel, *in litt.* 1988). Members of the group are restricted to four achipelagos in the South Indian Ocean Province, of the sub-Antarctic region, *viz.*, the Prince Edward Islands, Îles Crozet, Îles Kerguelen, and Heard and McDonald Islands [see Laws (1984) and Smith (1987) for descriptions of the abiotic and biotic environments of these islands]. During recent years all of the genera have been revised by Dreux and Voisin (1984, 1985, 1986*a*, 1986*b*, 1987). These revisions were based on adult morphology and culminated in a systematic study of the tribe (Dreux and Voisin 1988). There have, however, been few studies of the immatures of the Ectemnorhinini. Emden (1952) provided the first detailed description of Ectemnorhinini larvae, based on specimens of an *Ectemnorhinus* G. R. Waterhouse species from Îles Kerguelen. May (1970) published comprehensive descriptions of larvae and pupae of *Canonopsis sericea* C. O. Waterhouse, *Antarctonesiotes gracilipes* (C. O. Waterhouse) and *Ectemnorhinus grisescens* Enderlein from Heard Island, and revised Emden's (1952) tribal description. Chown and Scholtz (1989*a*) described the immatures of *Antarctonesiotes elongatus* Jeannel, *Bothrometopus randi* Jeannel, *Mesembriorrhinus brevis* (C. O. Waterhouse), *Palirhoeus eatoni* (C. O. Waterhouse) and *Dusmoecetes similis* (C. O. Waterhouse) from the Prince Edward Islands; they commented briefly on characters of use at the generic level and relationships within the tribe. No information is currently available on immatures of species found on Îles Crozet or Îles Kerguelen.

In this study, we describe the larva of *Christensenia antarctica* Brinck from Îles Crozet, provide additional information on the larvae of *Canonopsis sericea*

and *Ectemnorhinus grisescens,* and we revise the tribal description of Ectemnorhinini larvae. We also provide a preliminary phylogeny of the tribe, based on a cladistic analysis of 10 larval characters. Information on the biology and ecology of certain ectemnorhininine species can be found in Chown (1989) and Chown and Scholtz (1989*b, c*).

Methodology and Material Examined

Data on most of the genera came from the study undertaken by Chown and Scholtz (1989*a*) on the Prince Edward Islands fauna and the one by May (1970) on the Heard Island fauna. Additional information on *Canonopsis sericea* and *Ectemnorhinus grisescens* was obtained from material collected by the 1987/8 Australian expedition to Heard Island, and made available to us. The larva of *Christensenia antarctica* is described below. Emden (1952) was consulted for information on the larvae of adelognathan genera. The terminology used in this paper is based on that of Emden (1952) and May (1970) and is the same as that used by Chown and Scholtz (1989*a*).

Phylogeny was inferred using PAUP Version 2.4 (Swofford 1985) as implemented for an IBM personal computer. This programme is a simple parsimony model, with preferred trees being of a minimal length in a Manhattan metric, and no *a priori* restrictions on the nature of character state changes. All of the trees were produced with 8 taxa and 10 characters by the branch-and-bound algorithm, Farris optimization and outgroup rooting. In this case one (see below) of the 10 characters was unordered, *i.e.,* no *a priori* transformation series was assumed for this character, and thus the optimization algorithm did not apply to it. In such a case the reconstruction of HTU character states is arbitrary.

Because no sister group is known for the Ectemnorhinini the character states most commonly found in the Adelognatha [the functional outgroup *sensu* Watrous and Wheeler (1981)] by Emden (1952) were considered primitive (see below for more detail). For characters not listed by Emden (1952), the character states found in the genus *Canonopsis* were used because *Canonopsis* larvae and adults are close to the typical adelognathan form [see also Kuschel (1971) and May (1970)].

Tribe Ectemnorhinini

Description. Head free, with posterior margin moderately excavated, sutures distinct but with endocarinal line absent. Anterior and posterior ocelli conspicuous with convex cornea. Frons with one major seta (*fs* 4), *fs* 5 microscopic. Antenna circular with antennal cone varying from convex and protruding to flat. Mandible with bifid apex, with or without 2 accessory teeth. Clypeal sensilla anterior to or between setae. Labrum with paired sensilla level with or behind posterior setae. Epipharyngeal lining with anterolateral and anteromedian setae on margin; 3 pairs of median spines on distal third with clustered sensilla between the 2 anterior pairs. Premental sclerite with median extension distinct. Postlabium with posterior pair of setae closer together than the median pair.

Prothoracic shield and often other thoracic lobes pigmented. Terminal segments not modified. Meso- and metathorax with 1 + **2**[1] prodorsal setae, pedal area with 1 major seta. Abdominal segments with 4 dorsal folds; spiracular setae on third fold throughout; segments I to VI with 5 postdorsal setae and 1 + **1** spiracular setae; segments VII and VIII without the large spiracular seta; segment VIII with minute prodorsal seta; segment

[1] Figures in boldface indicate minor setae or microsetae.

IX with 1 + **2** dorsal, 1 + **1** pleural and 2 sternal setae. Thoracic and abdominal spiracles similar, bicameral with annulated airtubes. Anus terminal, 4-lobed.

The following description of *Christensenia antarctica* and the additional information concerning *Canonopsis sericea* and *Ectemnorhinus grisescens* do not greatly alter the key to the known Ectemnorhinini larvae, provided by Chown and Scholtz (1989*a*). Only the first two couplets require modification, and an additional couplet must be inserted to key out *Christensenia antarctica*. The modified key is as follows:

Key to the Known Ectemnorhinini Larvae (Modified from Chown and Scholtz 1989*a*)

1. Pronotum with 3 + 7 setae, clypeus with sensilla in front of or close to the interior setae; labrum with the paired sensilla level with or just behind the posterior setae 2
– Pronotum with 2 + **8** setae, clypeus with sensilla midway between the setae; labrum with paired sensilla placed well behind the posterior setae 2a
2. Labral tormae expanded at the apex; clypeus with sensilla in front of the interior setae; labrum with paired sensilla level with posterior setae; seta h on the pronotum relatively long; Kerguelen and Heard Islands ..... *Canonopsis sericea*
– Labral tormae not expanded at the apex; clypeus with sensilla close to the interior setae; labrum with paired sensilla just behind the posterior setae; seta h on the pronotum (Fig. 6) relatively short; Îles Crozet ..... *Christensenia antarctica*
2a. Dorsopleural lobe with major seta 7–8× minor seta (Abd. V); Heard Island ..... *Ectemnorhinus grisescens*
– Dorsopleural lobe with major seta not more than 5× minor seta (Abd. V) ..... proceed to couplet 3 in Chown & Scholtz (1989*a*)

Christensenia antarctica Brinck 1945:22 (Figs. 1–11)

Description. Head capsule breadth: 1.73–2.18 mm. Setae as in Table 1. Head flattened with sides slightly rounded, light brown with lateral lighter, partially sclerotised areas; postoccipital condyles distinct and square; *des* 3 contiguous (in) frontal suture. Antennal cone one-third width of basal cushion, convex, protruding. Clypeus unpigmented with sensillum closer and slightly anterior to interior microseta. Labrum light brown, triangular to trapezoidal, with paired sensilla almost in line with or placed slightly basally of posterior setae. Tormae well sclerotized, red-brown, distal third divergent, convergent towards base. Epipharyngeal sclerotization with median extension reaching beyond base of tormae. Hypopharyngeal armature lightly sclerotized, comprising two thin, elongated sclerites which curve anteriorly, proximally. Mandibles dark red-brown, stout; apical teeth moderately developed, equal in length, accessory teeth absent. Postlabium divided by indistinct oblique furrows. Maxilla with lacinia moderately sclerotized except for apex.

Pronotum with three major setae, two larger than third one (seta h of Emden 1952). Prothoracic shield light brown with thoracic lobes very lightly sclerotized. Thoracic spiracle subcircular with small airtubes, ⅘ width of peritreme, which has a broad sclerotized band surrounding it.

Major postdorsal setae (Abd. V) equal to or slightly greater than width of fold. Dorsopleural lobe (Abd. V) with major seta 3× longer than minor seta. Short setae especially on Abd. I–VII stout, thick, spinelike. All spiracles subcircular, with airtubes directed dorsocaudad.

Table 1. Setal index for *Christensenia antarctica*. Figures in boldface indicate minor setae or microsetae.

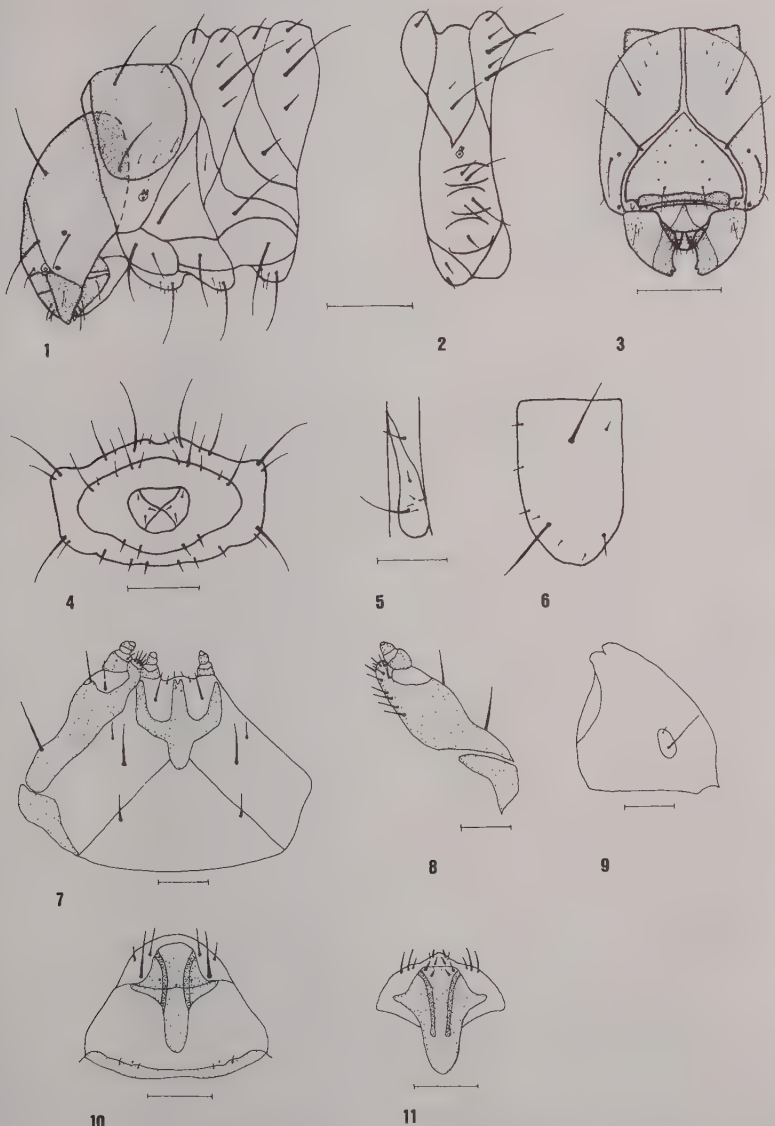
Prothorax		Abdomen X	
pronotum	3 + **7**	anal	**3**
ventropleural	1 + **1**		
mediosternal	1	Head	
pedal area	1 + **5**	dorsal	3 + **2**
		posterior	**4**
Meso-, Metathorax		lateral	1 + **1**
prodorsal	1 + **2**	ventral	1 + **1**
postdorsal	1 + **3**	frontal	1 + **4**
dorsolateral	1	clypeal	**2**
alar area	**2**	labral	3
dorsopleural	1	mandibular	1 + **1**
ventropleural	1		
mediosternal	1	Epipharyngeal lining	
pedal area	1 + **5**	anterolateral	3
		anteromedian	2
Abdomen I–VIII		median	3
prodorsal I–VII	1		
VIII	**1**	Maxilla	
postdorsal I–VII	2 + **3**	lacinial	12 + **1**
VIII	2 + **3**	palpal	**1**
spiracular I–VII	1 + **1**	stipital	1
VIII	1	palpiferal	2
dorsopleural	1 + **1**		
ventropleural	1 + **1**	Labium	
laterosternal	1	postlabial	1 + **2**
mediosternal	2	prelabial	1
		ligular	**2**
Abdomen IX			
dorsal	1 + **2**		
pleural	1 + **1**		
sternal	2		

REMARKS. Larvae of this genus are very similar to *Canonopsis* C. O. Waterhouse, but are distinguished by the shorter seta h on the prothoracic shield (Fig. 6), the non-expanded apex of the tormae, and the position of the clypeal and labral sensilla. Most of the larvae examined, apart from the voucher specimen, had many setae missing and were extremely brittle.

MATERIAL EXAMINED. Seven late instar larvae collected on Île des Pingouins, Îles Crozet, 24.X.86, 200 m, Arête NW stones in Tussock, *leg.* Ph. Dreux. One late instar larva collected on Île des Pingouins, Îles Crozet, 3.XII.1986, 200 m, Le Château, under stones, *leg.* Ph. Dreux. This latter specimen is designated a voucher specimen; it has an identification label bearing the species name as well as the number CAL 1. All the specimens are housed in the collection of Dr. J.-F. Voisin, Muséum National d'Histoire Naturelle, Paris.

Canonopsis sericea C. O. Waterhouse 1875:55

May (1970) provided a detailed description of both the larva and pupa of this species, and here we provide additional information on the larva and make some alterations to the setal configuration given in her paper. Maxilla with one



Figs. 1–11. Larva of *Christensenia antarctica* Brinck. 1, head and thorax, lateral view. 2, abdominal segment V, lateral view. 3, head, frontal view. 4, abdominal segments VIII–X, caudal view. 5, thoracic pedal and mediosternal areas, ventral view. 6, diagrammatic representation of left half of prothoracic shield, dorsal view. 7, maxilla and labium, ventral view. 8, maxilla, dorsal view. 9, right mandible, dorsal view. 10, clypeus and labrum, dorsal view. 11, epipharyngeal lining, ventral view. Scale lines: Figs. 1–5 = 1.0 mm, Figs. 7–11 = 0.25 mm.

minor palpal seta; meso- and metathorax with 1 + **2** prodorsal setae; abdomen VIII with 1 or **1** prodorsal seta, and 2 + **3** postdorsal setae; abdomen IX with 1 + **2** dorsal and 1 + **1** pleural setae. Mandibles with equal apical teeth; hypopharyngeal armature comprising two minute sclerites.

Material Examined. All the material was collected on Heard Island from November 1987 to February 1988. The specimens are housed in the Department of Entomology, University of Pretoria, Pretoria.

Ectemnorhinus grisescens Enderlein 1909:416

Emden (1952) and May (1970) provided descriptions of the larva of this genus. We make the following changes to May's (1970) description of this species. Clypeus with two microsetae; prothorax with 2 + **8** pronotal setae, 1 + **1** ventropleural setae; meso- and metathorax with 1 + **2** prodorsal setae, 2 alar microsetae; abdomen VIII with one prodorsal microseta and 1 + **4** postdorsal setae; abdomen IX with 1 + **2** dorsal setae. Mandibles with equal apical teeth; labral tormae well sclerotized, expanded slightly at the base, distal quarter divergent; hypopharyngeal armature comprising two red-brown sclerites.

Material Examined. All the material was collected on Heard Island from November 1987 to February 1988. The specimens are housed in the Department of Entomology, University of Pretoria, Pretoria.

Phylogenetic Analysis

Characters. Of the ten larval characters used in the phylogenetic analysis, most have been previously identified as important in the classification of Ectemnorhinini larvae (Chown and Scholtz 1989*a*; May 1970). Characters were polarized by considering the state found in the Adelognatha plesiotypic. Because we were unsure of the transformation series in character five, this character was left unordered. The data matrix used in the analysis is given in Table 2.

1. Mandible shape—Three ordered states of this character are recognized. Robust (0) as in *Canonopsis, Christensenia* and most Adelognatha; intermediate (1) as in *Ectemnorhinus*; and slender (2) as in the rest. Presence of state 0 in the outgroup Adelognatha suggests this state is plesiotypic, state 1 derived and state 2 most derived.

2. Apical mandibular teeth—Two states of this character are recognized. Equal in length (0) as in *Canonopsis, Christensenia, Ectemnorhinus* and Adelognatha; and unequal, with the dorsal tooth longer (1) as in the rest. Presence of state 0 in many Adelognatha suggests this state is plesiotypic.

3. Clypeal sensillum—Three ordered states of this character are recognized. In front of the interior seta (0) as in *Canonopsis* and most Adelognatha; between the setae but closer to the interior setae (1) as in *Christensenia*; and midway between the setae (2) as in the other genera. Presence of state 0 in the outgroup Adelognatha suggests this state is plesiotypic, state 1 derived and state 2 most derived.

4. Position of the paired labral sensilla—Four ordered states of this character are recognized. Placed in front of the posterior setae (0) as in most Adelognatha; placed between the setae (1) as in *Canonopsis*; placed just behind the setae (2) as in *Christensenia*; and placed well behind the setae (3) as in the other genera. Presence of state 0 in most Adelognatha suggests this state is plesiotypic; there is a clear transformation from the derived state 1 to the most derived state 3.

5. Antennal cone—Four unordered states of this character are recognized. Convex and protruding (0) as in *Canonopsis, Christensenia, Palirhoeus* and

Table 2. Data matrix used in the PAUP analysis.

Taxa	Characters and their states									
	1	2	3	4	5	6	7	8	9	10
Canonopsis C. O. Waterhouse	0	0	0	1	0	0	1	0	0	1
Christensenia Brinck	0	0	1	2	0	0	1	0	0	1
Ectemnorhinus G. R. Waterhouse	1	0	2	3	3	1	1	1	1	2
Bothrometopus Jeannel	2	1	2	3	2	2	2	1	1	2
Antarctonesiotes Jeannel	2	1	2	3	2	2	2	1	1	2
Mesembriorrhinus Jeannel	2	1	2	3	1	2	2	1	1	2
Palirhoeus Kuschel	2	1	2	3	0	2	2	2	0	2
Adelognatha	0	0	0	0	0	0	0	0	0	0

most Adelognatha; moderately convex (1) as in *Mesembriorrhinus*; slightly convex to flat (2) as in *Bothrometopus* and *Antarctonesiotes*; and flat (3) in *Ectemnorhinus*. Presence of state 0 in many Adelognatha suggests this state is plesiotypic. A transformation series was not clear among the apotypic states.

6. Position of *des* 3—Three ordered states of this character are recognized. Placed "in" the frontal suture (0) as in *Canonopsis, Christensenia* and most Adelognatha; placed immediately next to the frontal suture (1) as in *Ectemnorhinus*; and placed well away from the frontal suture (2) as in the remaining genera. Presence of state 0 in the outgroup Adelognatha suggests this state is plesiotypic, state 1 derived and state 2 most derived.

7. Ventral setae on the head—Three ordered states of this character are recognized. Setae: 2 (0) as in the Adelognatha; 1 + **1** (1) as in *Canonopsis, Christensenia* and *Ectemnorhinus*; and **2** (2) as in the rest. Presence of state 0 in most Adelognatha suggests this state is plesiotypic, state 1 derived and state 2 most derived.

8. Pronotal setae—Two states of this character are recognized. Setae: 3 + **7** (0) as in *Canonopsis* and *Christensenia*; and 2 + **8** (1) as in the rest. Presence of state 0 in *Canonopsis* and *Christensenia*, genera with accessory mandibular cusps and/or the associated scar in the adult stage (plesiotypic to the Adelognatha), suggests this state is plesiotypic.

9. Spiracle—Two states of this character are recognized. A broad sclerotized band surrounding the peritreme (0) as in *Canonopsis, Christensenia* and *Palirhoeus*; and sclerotization thin (1) as in the rest. Presence of state 0 in the genera *Canonopsis* and *Christensenia*, which have accessory mandibular cusps and/or the associated scar, suggests this state is plesiotypic.

10. Postdorsal setae (Abd. VIII)—Two states of this character are recognized. Setae: 2 + **3** (0) as in *Canonopsis* and *Christensenia*; and 1 + **4** (1) as in the other genera. Presence of state 0 in genera with accessory mandibular cusps and/or the associated scar (plesiotypic to the Adelognatha) suggests this state is plesiotypic.

Results and Discussion. Five trees of equal length (21.00) were produced by the branch-and-bound algorithm. All of the trees had the same placement of *Canonopsis, Christensenia* and *Ectemnorhinus*, but differed with regard to the placement of the remaining genera because of an unresolved polychotomy at node 11, although these genera always formed the sister group of *Ectemnorhinus, i.e.*, the trees were compatible with a majority consensus (Rohlf 1982). The consensus tree, including the apomorphies for each node, is shown in

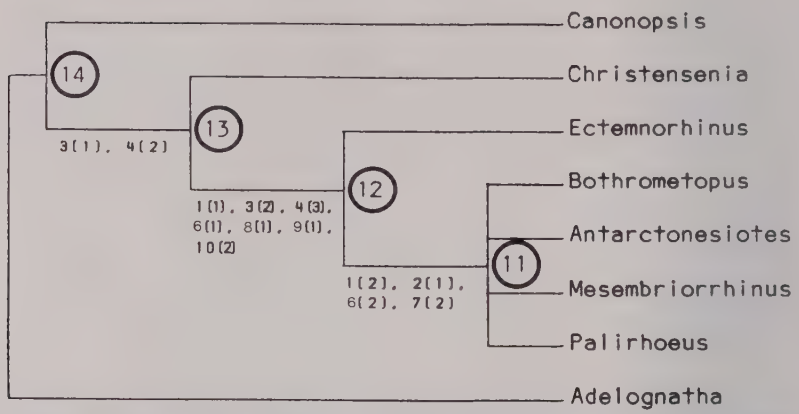


Fig. 12. Consensus tree produced using the five trees produced by PAUP, showing apomorphies at each node and the unresolved polychotomy.

Figure 12. The consistency index of all trees was high (0.952). Although no restrictions were placed on the nature of character state changes, there was only one reversal, *i.e.*, the plesiotypic state of the spiracle (character 9) is present in *Palirhoeus*.

The phylogeny proposed here is similar to the one suggested by Chown and Scholtz (1989*a*). It also bears some similarity to the scheme, based on adults, presented by Dreux and Voisin (1988), although in the current classification *Ectemnorhinus* is considered to be the sister group of the *Bothrometopus* group of genera, whereas in Dreux and Voisin (1988) *Ectemnorhinus* and *Antarctonesiotes* form one monophyletic group and *Bothrometopus, Mesembriorrhinus* and *Palirhoeus* another. Our classification is supported by data from adult morphology (unpublished) and the biology of members of this genus (see Chown 1989). Unfortunately we are unable to comment to any extent on the position of the genera *Disker* Dreux and Voisin, *Xanium* Enderlein and *Neocanonopsis* Hoffmann, because larvae of the members of these genera have not been described. The adults of *Xanium* are similar to those of *Ectemnorhinus,* and Kuschel (*in litt.* 1988) has stated that *Xanium* cannot be generically separated from *Ectemnorhinus.* Dreux and Voisin (1987), in their description of *Disker,* stated that it is primitive and resembles *Canonopsis* and *Christensenia,* and examination of adults of *Neocanonopsis dreuxi* Hoffmann shows that this species is closely related to *Christensenia antarctica.*

Lastly, in a comparison of the larvae of *Ectemnorhinus grisescens* and *Dusmoecetes similis* insufficient differences could be found between the genera to warrant the status of *Dusmoecetes* as a separate genus. Therefore the two genera were treated as synonymous in this study, and, based on this finding, there seems little reason to maintain the status of *Dusmoecetes.* This conclusion contrasts with that reached in a previous study (Chown and Scholtz 1989*a*), but at that time we based our conclusions on May's (1970) description of *Ectemnorhinus grisescens,* which stated that this species has unsclerotized labral tormae and 2 + **9** pronotal setae. An examination of a large series of this species has shown, however, that the labral tormae of *Ectemnorhinus* are similar to those of *Dusmoecetes* and that there are in fact 2 + **8** pronotal setae in the

former genus. The two genera are also identical with respect to other larval and adult characters used at the generic level. This finding is also different to that of Dreux and Voisin (1986*a*), who considered the genus to be valid based on adult characters.

Acknowledgments

We would like to thank Harry Burton of the Australian Antarctic Division for collecting weevils on Heard Island, and Drs. J.-F. Voisin and Ph. Dreux for providing weevil larvae from Îles Crozet and for discussion on the systematics of the Ectemnorhinini. Dr. G. Kuschel of the DSIR New Zealand is thanked for commenting on the position of the Ectemnorhinini in the Curculionidae and the habits of the Entiminae. Mrs. Brenda May of the DSIR, New Zealand, kindly provided unpublished diagrams of the mouthparts of species from Heard Island. We thank the reviewers for their extensive and incisive comments. Part of this research was undertaken in the Department of Entomology, University of California, Berkeley. This research was partly funded by the South African Department of Environment Affairs on the advice of the South African Scientific Committee for Antarctic Research (SASCAR).

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DONALD R. WHITEHEAD (1938–1990)

Born August 14, 1938, at Orange, NJ, Don Whitehead spent his pre-university years with his parents and brother in Morris Plains, NJ, where his father was a postal employee. Don received a Bachelor of Science degree in entomology from Rutgers University in 1960, and then served for two years in the Medical Service Corps of the United States Army, completing this term as a First Lieutenant in the fall of 1962.

As an undergraduate, Don showed marked interest in and talent for systematic entomology. In 1963, he began a Ph.D. program in this subject, in the Department of Entomology, at the University of Alberta, completing the requirements for the doctorate in 1971.

For the first few months of 1972, he worked as an assistant curator in the Strickland Entomological Museum, University of Alberta. For the period 1972–1976, he was employed as a Research Entomologist, Organization for Tropical Studies, at the United States National Museum of Natural History, Washington, DC. From 1976 until the time of his death (May 4, 1990), he was employed by the U.S. Department of Agriculture in the Agriculture Research Service, Systematic Entomology Laboratory, at the U.S. National Museum of Natural History.

Don's first major published work, based on his outstanding doctoral thesis, was about the scaritine carabid genus *Schizogenius* Putzeys of the New World. Interested also in platynine carabids, especially those of Middle America, he published a major synopsis of the previously described Mexican taxa of the genus *Platynus* Bonelli.

Following completion of his graduate studies, and as a Research Entomologist for the Organization of Tropical Studies and for the U.S.D.A., his interests turned to phytophagous Neotropical insects. His important studies of bruchids, weevils, and coreid bugs were summarized in a series of useful publications.

Although deeply interested in fundamental taxonomic and evolutionary problems at the species level, his position in the Agriculture Research Service required eventually that he turn his attention to more applied aspects of insect biodiversity. Thus, during the past few years, he worked and published in the general area of insect introductions.

Distracted during working hours from the pursuit of the more basic aspects of insect systematics, and with interest waning in the more descriptive aspects, Don devoted substantial amounts of his spare time to the study of Appalachian Diplopoda, an arthropod class that has attracted few workers. In this endeavor, he was encouraged, aided and abetted by Richard Hoffman and Rowland Shelley, well known for their outstanding work on diplopods, or millipeds.

Work on millipeds required intensive collecting in the Appalachian Mountains, and gave Don the opportunity to spend time in the field. Don enjoyed field work. An excellent collector, he found and prepared much of the material on which his carabid papers, and the papers of his colleagues, were based. His pursuit of specimens took him to Mexico several times. Though intensely interested in obtaining material, he was not overly possessive of what he had collected, and so many specimens were presented to interested colleagues. What he retained was readily available for study by others.

An excellent field companion, he had few and simple requirements, and when circumstances denied even these, he retained his equanimity and basic good humor, expressed in his own stoic way. In Mexico, his calm demeanor served him will in the sweltering heat of the lowlands, and in the mist, fog and rain of the mountains. Without complaint, day after day in miserable environmental conditions, he hunted out specimens needed to answer the questions about faunistics and evolution that he was formulating. Only in the rarefied atmosphere above tree line on the great volcanoes did his determination waver, when he suffered severely from altitude-induced headaches.

Don's published work in entomology was marked by clear expository writing; workable keys; detailed descriptions; excellent, carefully executed line drawings; and detailed analyses of phylogenetic relationships, including biogeographic aspects thereof. He regarded the description of taxa as burdensome, though necessary. Nonetheless, he described his share of new species of beetles, principally from the New World Tropics.

His principal, more general contribution to biodiversity was the analysis of distribution patterns, leading to postulation of refugia or centers of endemism and their positions in Middle America. His most generally interesting contribution, however, was the discovery of Müllerian mimicry in the milliped fauna of the Appalachian region. During the last two years of his life, Don laid the basis for detailed analysis of this phenomenon. Discovery of mimicry was the result of his insistence on detailed analysis and comparisons of the distribution patterns of species.

His interest in systematization (in the general sense of the term) also found expression in philately. Don developed a substantial collection of stamps, specializing in those of Mexico, and in Mexican postmarks. He was co-author of an extensive tome that illustrated the postmarks of Mexico from 1874 to 1900. Philatelists who specialize thus develop strong interests in other events related to their stamps, and indeed, Don delved deeply into the history of the Mexican postal system in particular, and into the history of Mexico in general.

In addition to systematics and philately, Don enjoyed singing and gardening. While a graduate student at the University of Alberta, he was a member of and toured the province with the University Male Chorus. His gardening interest did not express itself until he became a home owner. The flower beds and shrubs around his home in New Carrollton, MD, are a tribute to his care for them.

Very reserved and taciturn, self-effacing, and at times seemingly withdrawn to the point of moroseness, Don nonetheless enjoyed close association with neighbors and co-workers. Not given to talk that he deemed idle, he would hold forth at length about subjects that interested him. Patient and thorough, he thought deeply about questions that were put to him, and responded fulsomely. Mentally tough and determined, Don made the best of unfavorable situations. During the last few weeks of his life, when it seemed clear to others that the end was near, Don's innate courage was at the fore, and he expressed confidence that soon he would be out of the hospital and back to his home, doing the things that brought him pleasure and satisfaction.

Don was generous to his entomological colleagues and to others who shared his interests. He took the time to offer advice about execution of work in progress, and to review extensively if not exhaustively manuscripts submitted to him for criticism. Don's imaginative, incisive and detailed commentaries revealed to an author the oversights, inconsistencies, and gaffes that would have proven embarrassing if published. As well, Don provided different perspectives from which to interpret the data being presented. Because of the quality and depth of his insightful reviews, Don could have claimed, with justification, co-authorship of many of the publications that he reviewed.

At a more general level, Don served his scientific community through participation in the affairs of various societies of which he was a member. For the period 1976–1982, he was editor of the Coleopterists Bulletin. He served on the councils of the Society of Systematic Zoology, the Biological Society of Washington, and the Entomological Society of Washington.

West Virginia, with its verdant hills and exciting endemic arthropod fauna, had special appeal for Don and he planned to establish residence there, following retirement from government service. The fates that rule the lives of men intervened, and his plans were for naught. Nonetheless, the ashes that represented Don's mortal remains were deposited by his family along a wooded stream, near the town of Helvetia, WV. Thus, his final resting place is where he wanted to be. Furthermore, it is a location suitable for the arthropods that he was studying. Is this not fitting for an outstanding arthropodist?

Don Whitehead is survived by his wife, Gloria Jo (née Turner) and daughter Debra, his parents, Clara and Francis, and brother William. Their sorrow is shared by Don's many friends.

George E. Ball
Edmonton, AB

SCIENTIFIC NOTE

New Observations on Canadian Ptiliidae (Coleoptera)

Our knowledge of Canadian Ptiliidae largely rests upon Pacific Northwest species, which were treated over thirty years ago by Hatch (1957). Very few species seem to be reported from other parts of the country, and the family is extremely poorly known both taxonomically and faunistically. In Europe the situation is rather different. For some years we have had illustrated keys available which make use of primary and secondary sexual characters in most genera; these are largely due to the excellent work of Besuchet (1971) and Sundt (1971). Much of the earlier confusion of names in *Acrotrichis* for example was cleared up by both Sundt (1971) and Johnson (1987), and zoogeographic and bionomic studies in several parts of Europe are well advanced. My own work in the British Isles has led to the recognition of 73 species, only 7 of which have currently eluded me in the field. When it is seriously studied, there would thus appear to be good grounds for expecting the Canadian fauna to surpass the British one in terms of species-richness.

In view of current interest in a Canadian faunal list (Bousquet, in press), it seems desirable to place on record any facts which might advance our knowledge of Ptiliidae in Canada. Accordingly, a list of species is given below based upon specimens in the Manchester Museum collection which I have identified. These are all more-or-less well-known European species, largely associated with man's farming/gardening activities, and ten out of the twelve species are actually new to the Canadian fauna. After the list, some nomenclatural problems are discussed.

List of Species

The species listed are all new to Canada with the exception of *Ptenidium pusillum* (Gyllenhal) and *Acrotrichis cognata* (Matthews) (see Hatch 1957). Collectors' names are abbreviated as follows: DHM—D. H. Murray; SBH—S. B. Hill.

***Ptenidium nitidum* (Heer).** New Brunswick: Burton, 25.v.1972, in stump with animal or bird droppings, 1 ex. (DHM); Moncton, 14.viii.1972, ground under dead skunk, 4 ex. (DHM); Pointe du Chêne, 24.viii.1972, cut hay, 2 ex. (DHM).

***Ptenidium pusillum* (Gyllenhal).** Quebec: Notre Dame du Laus, Lac Serpent, 6.vii.1970, outdoor chicken manure heap at farm, large nos. (SBH). Nova Scotia: Halifax, 7.ix.1972, 1 ex. (DHM).

***Ptiliola brevicollis* (Matthews).** Quebec: Notre Dame du Laus, Lac Serpent, 6.vii.1970, outdoor chicken manure heap at farm, 5 ex. (SBH).

***Ptiliolum spencei* (Allibert).** Quebec: Notre Dame du Laus, Lac Serpent, 6.vii.1970, outdoor chicken manure heap at farm, 1 ♀ (SBH).

***Ptilium* (*Millidium*) *minutissimum* (Ljungh).** Quebec: Notre Dame du Laus, Lac Serpent, 6.vii.1970, outdoor chicken manure heap at farm, 20 ex. (SBH).

***Nephanes titan* (Newman).** Quebec: Notre Dame du Laus, Lac Serpent, 6.vii.1970, outdoor chicken manure heap at farm, large numbers (SBH).

***Acrotrichis* (*Ctenopteryx*) *grandicollis* (Mannerheim).** Quebec: Notre Dame du Laus, Lac Serpent, 6.vii.1970, outdoor chicken manure heap at farm, 1 ex. (SBH).

***Acrotrichis cognata* (Matthews).** New Brunswick: Burton, 25.v.1972, in stump with animal or bird droppings, 3 ex. (DHM); Moncton, 8.vi.1972, skunk carcass, 5 ex. (DHM).

***Acrotrichis fascicularis* (Herbst).** New Brunswick: Pointe du Chêne, 24.vii.1972, cut hay, 4 ♂♂, 2♀♀ (DHM).

***Acrotrichis sericans* (Heer).** Quebec: Notre Dame du Laus, Lac Serpent, 6.vii.1970, outdoor chicken manure heap at farm, 11 ex. (SBH). New Brunswick: Pointe du Chêne, 24.vii.1972, cut hay, 2 ♀♀ (DHM).

***Acrotrichis thoracica* (Waltl).** Quebec: Notre Dame du Laus, Lac Serpent, 6.vii.1970, outdoor chicken manuer heap at farm, 14 ex. (SBH).

***Acrotrichis volans* (Motschulsky).** New Brunswick: Moncton, 14.viii.1972, ground under dead skunk, 1 ♀ (DHM).

Nomenclatural Notes

***Ptilium* Gyllenhal.** Three Canadian species were described under *Ptilium* by Matthews (1872, 1877), a placement also followed by Hatch (1957). These species, *sharpi* Matthews, *obscurum* Matthews and *columbianum* Matthews, lack the pronotal grooves characteristic of almost all true *Ptilium,* and should be transferred to the genus *Ptiliolum* Flach. I have confirmed this placing by examining syntypes of all three species in the Matthews collection at the British Museum (Nat. Hist.), London. Therefore *Ptiliolum sharpi* (Matthews), *P. obscurum* (Matthews) and *P. columbianum* (Matthews) are **new combinations**.

***Acrotrichis pruinosa* Hatch.** According to the describer (Hatch 1957), *pruinosa* can be distinguished from other nearctic species by the pruinose elytra and scutellum. This is a highly characteristic feature, and shows the species to be identical with the true *cognata* (Matthews), which is an immigrant species in Europe that we previously called *platonoffi* Renkonen (Sundt 1971). I have compared Idaho and Canadian specimens with European ones in order to confirm the synonymy. My late friend Eivind Sundt had earlier seen the types of *coganata,* and I also believe of *pruinosa,* and was of the same opinion. Consequently *A. pruinosa* Hatch is a **new synonym** of *A. cognata* (Matthews). One unresolved point concerns the identity of *cognata sensu* Hatch, which might perhaps represent an additional species.

Acknowledgments

I am indebted to the following friends and colleagues in the preparation of this work: D. H. Murray and S. B. Hill for collecting material; M. Sörensson for recently confirming the identification of all the *Acrotrichis* mentioned here; P. M. Hammond for access to the Matthews collection; the late E. Sundt for correspondence; and J. M. Campbell for stimulating this work.

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SCIENTIFIC NOTE

Ground Beetles in Canopy Collections in Connecticut (Coleoptera: Carabidae)

Between 1981 and 1985, the U.S. Department of Agriculture Forest Service, Northeastern Forest Experiment Station, Center for Biological Control of Northeastern Forest Insects & Diseases, sprayed the canopies of various tree species to assess spatial distribution of gypsy moth caterpillars. Spray collections were made from late May to early July each year in mixed hardwood and pine forest areas in the lower Connecticut River Valley in North Stonington, Connecticut. The trees, ranging from 20 to 60 feet high, were sprayed with a pyrethrum-based spray administered through an extension boom. Falling insects were collected on sheets spread beneath each tree. One of the authors (P.A.G.) saved and sorted the carabid beetles from these collections and the other (W.L.K.) identified most of them.

The 693 carabids collected comprised 27 species. These are listed in Table 1 by year of collection. The majority of specimens (91%) belong to one of three species: *Cymindis limbata* Dejean (15%), *C. platicollis* Say (67%), or *Dromius piceus* Dejean (9%). The two former species are often collected under bark, and *D. piceus* is considered truly arboreal (Lindroth 1969). Mahar *et al.* (1983) collected larvae and a pupa of this species from oaks in western Michigan. The other carabid species collected, each represented by 10 or fewer specimens, have been collected in diverse habitats in Connecticut by the authors and their colleagues, and are not known to be exclusively associated with trees. Two of the species, *Oodes amaroides* Dejean and *Stenolophus rotundicollis* Haldeman, were

Table 1. Number of specimens by year of collection.

Species	1981	1982	1983	1984	1985
Carabus limbatus Say			1		
Calosoma frigidum Kirby	1				
C. sycophanta Linnaeus	1				
Notiophilus novemstriatus LeConte			1		
Agonum aeruginosum (Dejean)			1		
A. gratiosum (Mannerheim)			1		
A. moerens (Dejean)			1		
A. tenue (LeConte)			2		
Platynus decentis (Say)			1		
P. parmarginatus Hamilton					1
Amara familiaris Duftschmid	3		3		
Bradycellus badipennis Haldeman			5		
Stenolophus fuliginosus Dejean					1
S. rotundicollis Haldeman			1		
Anisodactylus sanctaecrucis (Fabricius)			1		
Amphasia interstitialis (Say)			3		
A. sericea (Harris)				1	
Harpalus affinis Schrank				1	
H. pennsylvanicus (DeGeer)				2	
Oodes amaroides Dejean				1	
Cymindis limbata Say	2	5	50	26	21
C. platicollis Say	24	46	246	128	24
Lebia ornata Say		4	4	2	
L. viridis Say			8		
Dromius piceus Dejean	9	3	38	8	7
Galerita bicolor Drury		2			2
Brachinus fulminatus Erwin			1		

collected for the first time in Connecticut during this study, and two others, *Agonum moerens* (Dejean) and *Platynus parmarginatus* Hamilton, were only recently noted as species occurring in the state (Krinsky and Oliver 1988). The dearth of *Calosoma* species in the collections during these years of heavy gypsy moth infestations is somewhat surprising considering how active these species are as caterpillar predators; however, these beetles may have evaded the spray by hiding during the daylight hours under bark or in the forest litter.

The diverse representation of carabids that occurred on the canopy collection sheets suggests that the knockdown effects of the spray were quite widespread and not specific to the upper levels of the trees sprayed.

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The Coleopterists Bulletin, 44(3):271–273. 1990.

A NEW SPECIES OF *AEGIALIA* (*AEGIALIA*) (COLEOPTERA: SCARABAEIDAE: APHODIINAE) FROM SOUTHERN ARIZONA AND NEW DATA ON NORTH AMERICAN *AEGIALIA*

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Abstract

The first specimen of the genus *Aegialia* to be recorded from southern Arizona, *A. mcclevei*, n. sp., is described and compared with similar appearing species. Distribution data for *A. conferta* Horn are presented. *Aegialia rufina* Silfverberg, a replacement name for the preoccupied name *A. rufa* (F.), is noted.

The North American members of the tribe Aegialiini were taxonomically revised by Gordon and Cartwright (1988). Subsequently, one specimen of a new species from southern Arizona was examined and is described here, bringing the total number of North American species in *Aegialia* (*s. str.*) to 19.

Members of *Aegialia* occur throughout most of the United States with the exception of the southeastern portion. All of the western states are represented, including Arizona with 2 species, but no specimens of this genus have previously been recorded from southern Arizona. Reasons for this lack of representation are uncertain. Most *Aegialia* are not attracted to lights; rather they occur as detritivores in damp, sandy or gravelly substrates. Unless flushed out by flood water they are often difficult to collect, hence a possible explanation for the lack of southern Arizona material.

McCleve (1979) described the collecting locality of this new species of *Aegialia* as "... unique, rich in beetle taxa, accessible and seldom visited by coleopterists. Aravaipa Creek, with populations of 8 native desert fish, is the least disturbed of all live streams in the Arizona portion of the Sonoran Desert. The high canyon walls and permanent water sustain large cottonwood, willow, sycamore, box elder, ash, oak, hackberry, and truly giant black walnut trees. Some of the trees support large vines of native grape. There are a few junipers, but no pines except for pinyon pines on the tablelands above the canyon. The more xeric exposures support *Yucca* and mesquite and other more typically desert species, including saguaro and other cacti."

Aegialia (*Aegialia*) *mcclevei*, Gordon, **n. sp.**

Description. Female holotype, length 4.30 mm, greatest width 2.10 mm. Form elongate, oval, widest at apical ⅓. Color dark brown except pronotal margins, apex of elytron, prosternum, and legs yellowish brown. Head granulate, lacking punctures; clypeal apex distinctly emarginate, gena not produced. Pronotum smooth except discal area lightly wrinkled; discal punctation fine, punctures separated by less than to 4 times their diameters, becoming sparse, finer laterally. Elytron with interval convex, nearly impunctate, striae distinctly impressed with fine punctures separated by 1½ times their

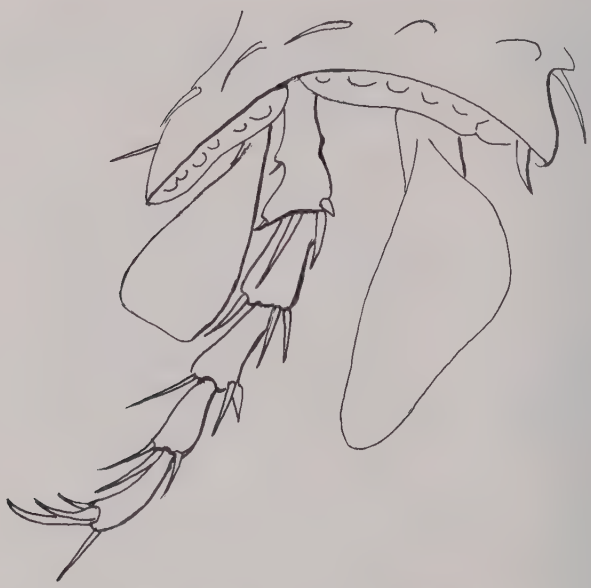

Fig. 1. Metatibial spurs of *Aegialia mcclevei,* new species.

diameters. Metasternum smooth, essentially impunctate medially, alutaceous, impunctate laterally. Functional wings present. Mesotibia slender; with surface denticles in basal ⅓; incomplete transverse carina at midpoint; apical spurs slender, inner spur as long as first 3 tarsal segments, outer spur as long as first 2 tarsal segments. Metafemur with apical flange produced, elongate, inner angle obsolete. Metatibia moderately robust; with numerous surface denticles; short transverse carina at apical ⅓; apical spurs short, foliaceous, outer spur as long as first 3 tarsal segments, inner spur apically truncated with slight emargination (Fig. 1), as long as first 2½ tarsal segments. Genital plate absent.

Type Material. Holotype: Arizona, Graham Co., Aravaipa Can., 6-9&10-1975, McCleve & Stephan (USNM).

Remarks. *Aegialia mcclevei* will go to couplet 6 in the key to species of the subgenus *Aegialia* in Gordon and Cartwright (1988); the female lacks a genital plate. The two species currently in the couplet are *A. kelsoi* Gordon and Cartwright and *A. nigrella* Brown, each of which has a normally spatulate inner hind tibial spur, *i.e.,* spur not apically truncated as in *A. mcclevei. Aegialia conferta* and *A. kelsoi* Gordon and Cartwright are the only species of *Aegialia* previously known from Arizona but they are not known from the southern Arizona mountains; therefore *Aegialia mcclevei* is the first record from this area.

Aegialia (*Aegialia*) *conferta* Horn

The distribution data for *A. conferta* Horn were inadvertently omitted from Gordon and Cartwright (1988). It is no longer practical to duplicate the actual specimen data because all borrowed material has been returned, but the distribution can be described in general terms as follows: southeastern Canada

and northeastern United States west to southern Alberta and Montana, with two disjunct New Mexico localities. In addition, one specimen of *A. conferta* from Holbrook, Navajo Co., Arizona, establishes a new state record.

Aegialia rufina Silfverberg

Scarabaeus rufus F. 1792, preoccupied by *Scarabaeus rufus* De Geer 1778. *Aegialia rufina* Silfverberg 1977:91, replacement name for *A. rufa* (F.).

A replacement name for *A. rufa* (F.) was proposed by Hans Silfverberg (1977), but overlooked by Gordon and Cartwright (1988). This oversight was kindly brought to my attention by Giovanni Dellacasa, Genova, Italy, and I thank him for the information.

Acknowledgments

Thanks are due Scott McCleve, Douglas, Arizona, for providing the specimen described. For reviewing the manuscript I thank B. Ratcliffe, University of Nebraska, Lincoln; A. Hardy, California Department of Agriculture, Sacramento; and F. C. Thompson, Systematic Entomology Laboratory, Washington, DC. The illustration was done by F. E. Wood, Department of Entomology, University of Maryland, College Park.

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REVIEW OF THE OZARK HIGHLAND *SCAPHISOMA* (COLEOPTERA: SCAPHIDIIDAE)

Richard A. B. Leschen,[1] Ivan Löbl,[2] and Karl Stephan[3]

Abstract

Keys and diagnoses are provided for the identification of nine species of *Scaphisoma* from the Ozark Highland. *Scaphisoma stephani* Leschen and Löbl, new species, is described. Lectotypes are designated for: *S. carolinae* Casey, *S. ornatum* Fall, *S. pusillum* LeConte, *S. suturale* LeConte, *S. impunctatum* Reitter, and *S. terminatum* Melsheimer. New synonymies are: *S. arkansana* Casey (= *S. carolinae*), *S. obesula* Casey (= *S. impunctatum*), and *S. evanescens* Casey and *Baeocera punctipennis* Blatchley (= *S. terminatum*). Information about fungus hosts and distribution are provided. Discussions about terminology and nomenclature are included.

"To the general student of Coleoptera [the Scaphidiidae] are less interesting than usual" (Casey 1893). Our opinion is quite the opposite. Casey was probably referring to the fact that most scaphidiids are small, shiny-black, and tear-drop in shape. Upon closer examination, these beetles reveal many useful characters for identification.

Many species of scaphidiids have been associated with fungus (Newton 1984). Species of *Scaphisoma* are found commonly on members of the Basidiomycetes, particularly the Polyporaceae, Clavariaceae, and the Tremellales (Newton 1984; Leschen 1988). *Scaphisoma* larvae have well-developed subapical pseudomolae on the mandibles which enable them to feed inside the sporocarps (Leschen 1988). In contrast, the adults possess typical spore-feeding mandibles and are found on the exterior of the sporocarps (Fig. 1). In this paper we will show that some *Scaphisoma* species are not necessarily attracted to higher fungi.

Scaphisoma is a diverse world-wide genus, although its members are poorly represented in cool or dry areas. There are about 490 valid species, about 20 species of which occur in the United States.

LeConte (1860) was the first to revise the North American Scaphidiidae; he added five species to the two previously known species of *Scaphisoma.* Casey revised the family twice (1893, 1900), and in his second revision he erected the genus *Scaphiomicrus* for the smaller species of *Scaphisoma.* Subsequently, Fall (1910) deemed *Scaphiomicrus* unnecessary. Other studies on *Scaphisoma* were regional (Blatchley 1910; Hatch 1957) or consisted of single species descriptions.

We limit our study to those species found in the Ozark Highland, since two of us (K. Stephan and R. Leschen) have collected intensively in this area. The Ozark Highland is a group of mountains located mostly in Arkansas, Missouri, and Oklahoma.

The purpose of this paper is to provide a key to the Ozark Highland *Scaphiso-*

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Fig. 1. *Scaphisoma impunctatum,* left mandible, ventral view.

ma, describe a new species, and standardize descriptive terminology. Diagnoses are given for previously known species and for all species we provide discussions about biology and lists of fungus hosts, if known.

Methods

Most specimens were collected by K. Stephan in Latimer Co., Oklahoma, and R. Leschen in various localities in Arkansas and Missouri. Additional specimens were examined from the University of Arkansas Insect Collection (UAIC), Fayetteville; Field Museum of Natural History, Chicago, IL (FMNH); and the Snow Entomological Museum (SEMC), University of Kansas, Lawrence. Except where otherwise noted, specimens are deposited in the above and following collections: K. Stephan collection (KSC), R. A. B. Leschen collection (RALC), and the Muséum d'Histoire naturelle, Genève, Switzerland (MHNG). Types from the following museums were examined: Museum of Comparative Zoology, Harvard University, Cambridge, MA (MCZ): Muséum National d'Histoire naturelle, Paris, France (MNHP): National Museum of

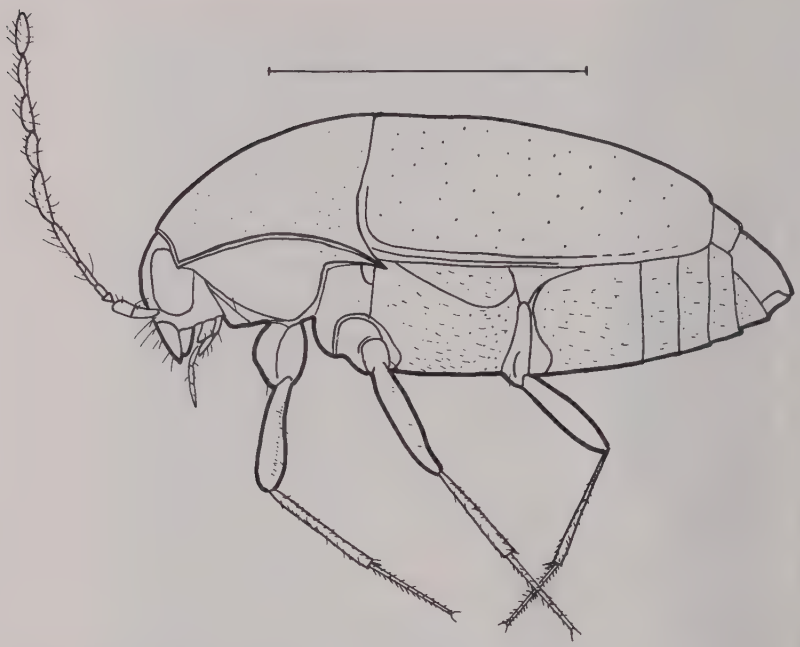


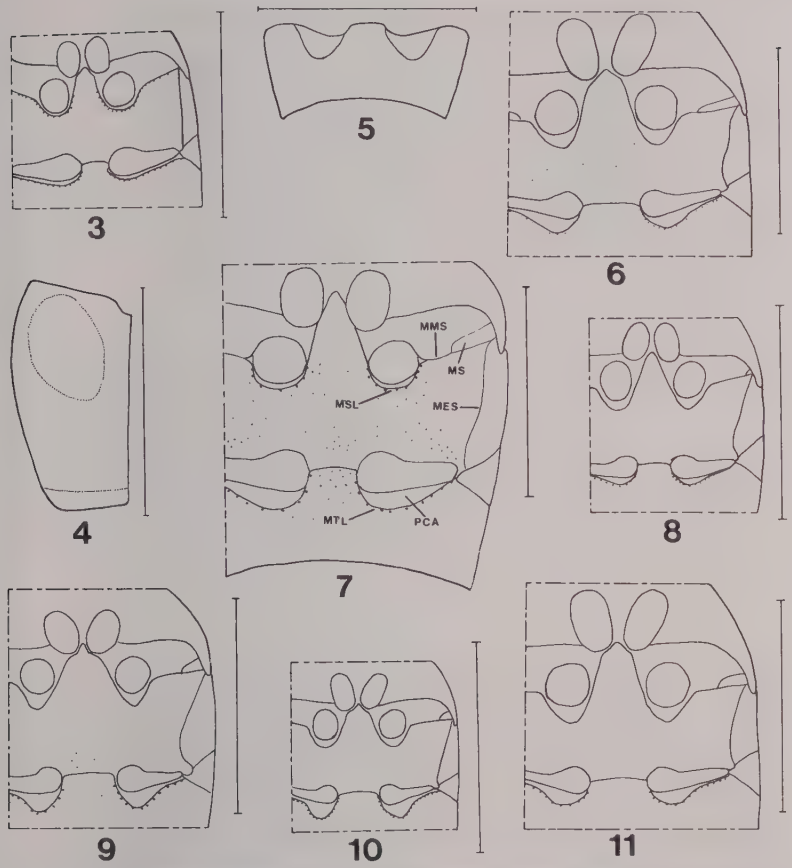
Fig. 2. *Scaphisoma stephani,* n. sp., lateral habitus. (scale bar = 1.0 mm).

Natural History, Washington, DC (USNM): Purdue Entomological Research Collection, Purdue University, West Lafayette, IN (PERC).

Most *Scaphisoma* specimens were collected by sifting litter and debris; some were taken in flight intercept traps (FIT) and many others were removed from fungus by hand. Fungus specimens and beetles were given field numbers, and after fungus identification was confirmed all specimens were labelled with their respective hosts.

By virtue of their small size and tear-drop shape, extraction of the male genitalia is difficult. We recommend that fresh specimens be placed on a damp paper towel and held, venter up, with watchmaker's forceps or a pin. Then gently remove the last abdominal segments with a fine needle and pull the aedeagus free. If the specimen is not sufficiently relaxed, or if the aedeagus is too large, remove the whole abdomen. The aedeagus may then be extracted through the large proximal orifice. Connecting tissue and muscles can be removed efficiently when the aedeagus is submerged in water or dilute ammonium hydroxide. For rapid examination, it is advantageous if the aedeagus is then mounted in Canadian balsam on an acetate label and pinned below the specimen. The removed abdominal parts should be glued venter up for ease of character examination.

In the following text, specimens mentioned in the material examined are those the specific identity of which was confirmed. Geographical distributions are based both on published information and data taken from labels on the specimens examined. Names of fungus hosts are followed by the month of collection and, parenthetically, the number of adults collected.



Figs. 3–7. *Scaphisoma* spp. 3, *S. carolinae,* thorax, ventral view; 4, *S. ornatum,* left elytron. 5, *S. pusillum,* abdominal sternite I. 6, *S. suturale,* thorax, ventral view. 7, *S. convexum,* thorax, ventral view. MES = metepisternal suture, MMS = meso-metasternal suture, MS = mesepimeron, MSL = mesocoxal line (parallel to coxa), MTL = metacoxal line (convex), PCA = postcoxal area. Scale bars = 1.0 mm.

Figs. 8–11. *Scaphisoma* spp., thoraxes, ventral views. 8, *S. impunctatum.* 9, *S. stephani,* n. sp., 10, *S. terminatum.* 11, *S. punctulatum.* Scale bars = 1.0 mm.

Terminology

Many specific features of *Scaphisoma* occur externally, and have been described previously by various authors using a variety of names. We consider some of these terms erroneous and misleading. The following paragraphs list these characters with the terminology here used.

Lateral stria (Fig. 2)—The stria dorsal to epipleuron and continuing along basal margin of elytron. This stria may be obliterated at the base of the lateral margin or broken at the humeral angle. This variation can occur within species

and its taxonomic use is questionable. Casey (1893, 1900) based some species descriptions on strial variation.

Length—The distance between middle anterior margin of pronotum and apex of elytra at suture. Since the abdomen is often distorted after death, this method provides a better indication of size than total length.

Mesepimeron (Fig. 7)—The sclerite often present between lateral area of mesosternum and anterolateral area of metasternum. This sclerite might not be the true mesepimeron (Newton, pers. comm.); however, when present, it is marked internally by a ridge. Its length proportional to the length of the meso-metasternal suture is taxonomically informative. Sometimes its length is difficult to measure accurately when the specimen is distorted. Its taxonomic significance was first observed by Casey (1893).

Postcoxal area (Fig. 7)—The area between postcoxal line and coxa. It has been termed previously the postcoxal plate (Casey 1893, 1900; Blatchley 1910; Fall 1910). The postcoxal line is not marked internally by a ridge. We consider the old term misleading.

Postcoxal (meso- or metacoxal) line (Fig. 7)—The line on metasternum or abdominal sternum I posterior to coxal foramen. This line is often margined with punctures, and its shape is species specific. These shapes are: convex (Fig. 7, metacoxa), sinuate (Fig. 10, metacoxa), and parabolic (Fig. 11, mesocoxa). When the line follows the posterior margin of the coxal foramen, we call this arrangement parallel (Fig. 7, mesocoxa).

Scaphisoma Leach

Diagnosis. Distinguished from other North American Scaphidiidae (which include *Baeocera, Cyparium, Caryoscapha, Scaphidium, Scaphium,* and *Toxidium*) as follows: Antennal segment III asymmetrically triangular and more or less flattened, antennal segments VII–XI flattened and forming a loose club. Galea large, terminal segment of maxillary palp tapering and at least as wide as preceding segment or stouter (never securiform). Procoxal cavities closed posteriorly. Metacoxae transverse and separated. Abdominal sternum I often with distinct postcoxal lines.

Nomenclature. There is some confusion regarding the gender of the name *Scaphisoma,* due in part to the opinion of Casey (1893; see lengthy footnote at bottom of pages 524–525). The second component of the name *soma* is a Greek neuter noun. Therefore, the whole name is neuter (ICZN, Art. 30a). The species names in *Scaphisoma* that are adjectives, would therefore have neuter endings (ICZN, Art. 31b).

Key to the Ozark Highland *Scaphisoma*

1. Mesepimeron absent (Fig. 3); metacoxal line parallel to coxal foramen ..... 1. *S. carolinae* Casey
– Mesepimeron present; metacoxal line not parallel to coxal foramen 2
2. Elytron with basal macula (Fig. 4) ..... 2. *S. ornatum* Fall
– Elytron without basal macula 3
3. Metacoxal line not margined with punctures (Fig. 5) ..... 3. *S. pusillum* LeConte
– Metacoxal line margined with punctures 4

4. Mesepimeron longer than one-half length of meso-metasternal suture (Fig. 6) 5
– Mesepimeron less than or equal to length of meso-metasternal suture 6
5. Abdomen darker or only slightly paler than thorax or elytra; abdominal sternum I with microsculpture consisting of distinct transverse lines ..... 5. *S. suturale* LeConte
– Abdomen conspicuously paler than thorax or elytra; abdominal sternum I with microsculpture consisting of points and meshes ..... 9. *S. punctulatum* LeConte
6. Mesocoxal line parallel to coxa (Fig. 7); length usually 2.3–2.8 mm ..... 4. *S. convexum* Say
– Mesocoxal line not entirely parallel to coxa; length less than 2.4 mm 7
7. Mesepimeron less than one-third length of meso-metasternal suture; metasternum without punctures (Fig. 8) ..... 6. *S. impunctatum* Reitter
– Mesepimeron more than one-third length of meso-metasternal suture; metasternum with coarse punctures (Figs. 9, 10) 8
8. Metepisternal suture strongly arcuate in posterior half; sides of metasternum and abdominal sternum I coarsely punctate (Fig. 9) ..... 7. *S. stephani* Leschen and Löbl, n. sp.
– Metepisternal suture weakly arcuate in posterior half; sides of metasternum and abdominal sternum I finely punctate (Fig. 10) ..... 8. *S. terminatum* Melsheimer

1. *Scaphisoma carolinae* Casey
(Figs. 3, 12, 13)

Scaphisoma carolinae Casey 1893:531. Type material: Lectotype (here designated), male, labelled: N. C./Casey bequest 1925/TYPE USNM 48764/carolinae (USNM).

Scaphisoma arkansana Casey 1893:532. Type material: Holotype, female, labelled: Ark/Casey bequest 1925/TYPE USNM 48765/arkansana (USNM). **New synonymy.**

Diagnosis. Length 1.2–1.5 mm. Body black; apices of elytra and abdomen, legs, and antennae pale yellow. Mesepimeron absent. Mesocoxal lines parallel and united with meso-metasternal suture, margined with punctures. Metasternum smooth. Metepisternal suture straight. Metacoxal lines confluent with metacoxal foramina, margined with punctures. Abdominal sternum I smooth, without punctures or microsculpture. Elytral punctation distinct.

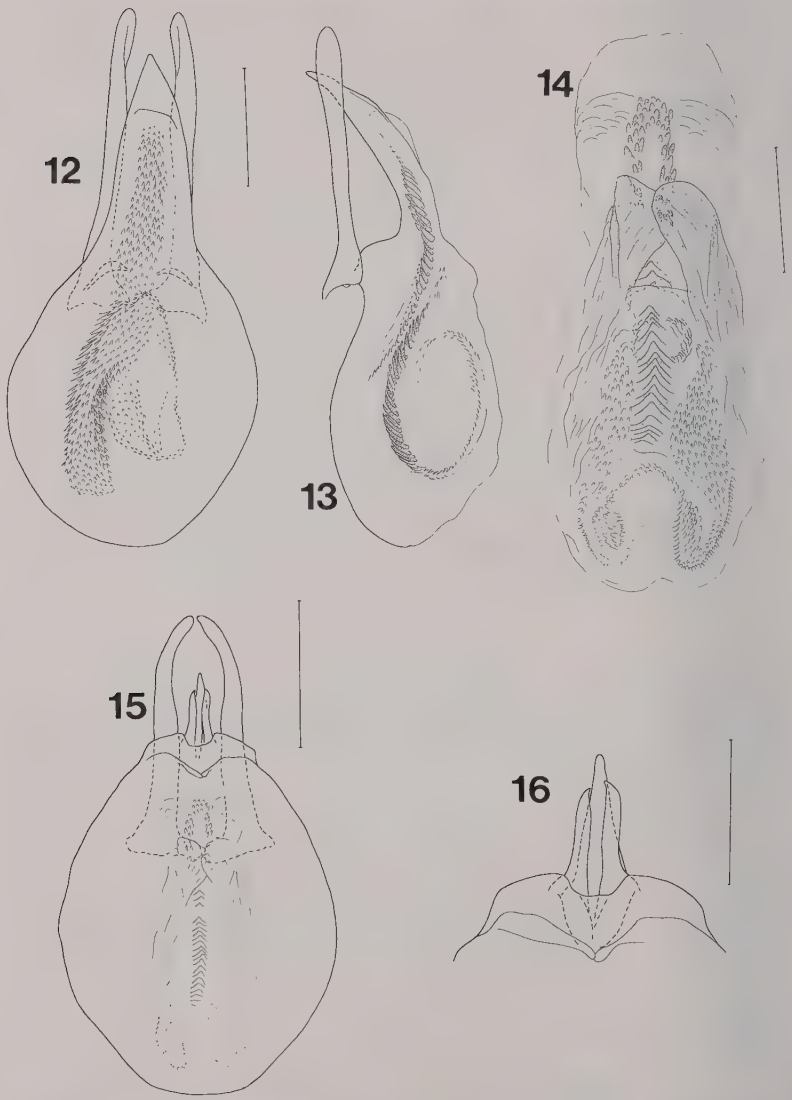
Male. Parameres long and slender, shorter than median lobe. Internal sac spiral in a vertical plane, spinose.

Remarks. This is the only species in our area that lacks the mesepimeron and has the metacoxal lines parallel.

Material Examined. **Arkansas:** 1, Arkstrom. **Florida:** 2, Marion Co., sand trail to Oklawaba Swamp, 10–15.VI.86, S. Marshall. **Illinois:** 4, Volo Bog, 29.III.68, A. Smetana. **Oklahoma:** 6, Latimer Co., Red Oak, 15.IX.76, 11.XII.77, I.82, XII.86, X.87, K. Stephan.

Distribution. Arkansas, Florida, Illinois, North Carolina, and Oklahoma.

Biology. This species is uncommonly sifted from forest litter. Adults have been collected during all months except May, August and November.



Figs. 12–16. *Scaphisoma* spp., aedeagi. 12, 13, *S. carolinae,* dorsal and lateral views. 14–16, *S. ornatum.* 14, internal sac. 15, dorsal view. 16, apex of median lobe. Scale bars = 0.1 mm.

2. *Scaphisoma ornatum* Fall
(Figs. 4, 14–16)

Scaphisoma ornatum Fall 1910:117. Type material: Lectotype (here designated), female, labelled: Mobile, Ala. II-09 H. P. Löding/ornata TYPE/ M.C.Z. TYPE 24120/H. C. Fall collection (MCZ). Paralectotypes: male, female, labelled: Mobile Ala. VI-21; 2 males, labelled: Mobile Ala. II-09 H. P. Löding; female, labelled: Mobile Ala. VII-08 H. P. Löding; female, labelled: in Fungus/Oak/Mobile Ala. IX-11-08 H. P. Löding (all MCZ).

Diagnosis. Length 1.6 mm. Body black; elytra with basal yellow-red maculae; apex of elytra, venter, legs, and antennae pale yellow. Mesepimeron longer than ½ length of meso-metasternal suture. Mesocoxal lines parallel, margined with indistinct punctures. Metasternum finely punctate with fine microsculpture. Metepisternal suture almost straight. Metacoxal lines parabolic. Abdominal sternum I with microsculpture. Elytral punctation distinct.

Male. Parameres slender, shorter than bulbous median lobe. Median lobe with trifid apex, internal sac complex.

Remarks. Maculate elytra in combination with mesepimeron longer than ½ the length of the meso-metasternal suture will identify this species from others in the Ozark Highland.

Material Examined. **Oklahoma:** 2, Latimer Co., 5 mi. W. Red Oak, 20.XI.1977, I.1983, K. Stephan.

Distribution. Alabama and Oklahoma.

Biology. This species is rarely collected and has been taken on fungus and sifted from forest litter in September and October.

3. *Scaphisoma pusillum* LeConte
(Figs. 5, 17, 18)

Scaphisoma pusillum LeConte 1860:323. Type material: Lectotype (here designated), male, labelled: S.C./S. pusillum LeC./TYPE 6640 (MCZ). Paralectotypes: sex not determined, labelled: Scaphisoma pusillum LeConte det. Löbl 1988 (and a small red disk) (MCZ).
Scaphiomicrus pusilla, Casey 1900:59.
Scaphiomicrus dimidiata Casey 1900:59; Fall 1910:119 (synonymy).

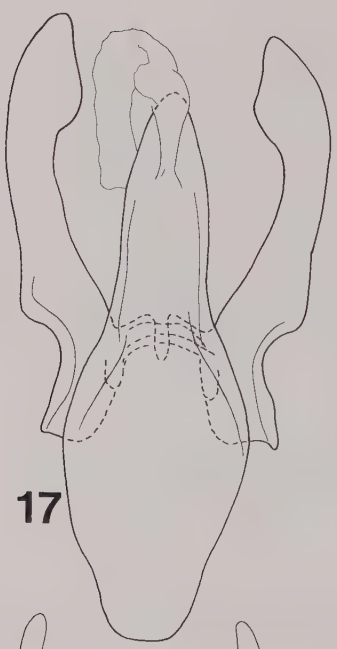
Diagnosis. Length 1.0–1.2 mm. Body black; apices of elytra and abdomen, legs, and antennae pale yellow. Mesepimeron less than ½ length of meso-metasternal suture. Mesocoxal lines convex, margined with indistinct punctures. Metasternum finely punctate, without microsculpture. Metepisternal suture straight. Metacoxal lines parabolic and not margined with punctures. Abdominal sternum I often with strong microsculpture. Elytral punctation distinct.

Male. Parameres massive, length subequal to that of median lobe. Internal sac smooth.

Remarks. This is the smallest species in our area. The metacoxal lines without marginal punctures and the massive parameres are diagnostic. Variation in the strength of the microsculpture on abdominal sternum I was noted in some specimens.

Material Examined. **Oklahoma:** 4, Latimer Co., Red Oak, 15.IX.77, XII.81, XII.87, XI.81, K. Stephan.

Distribution. Kansas, Massachusetts, North Carolina, Oklahoma, South Carolina, and Virginia.



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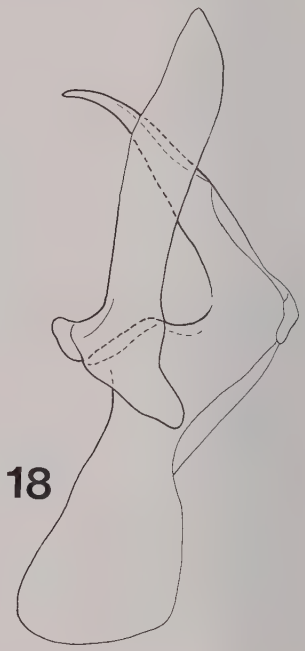

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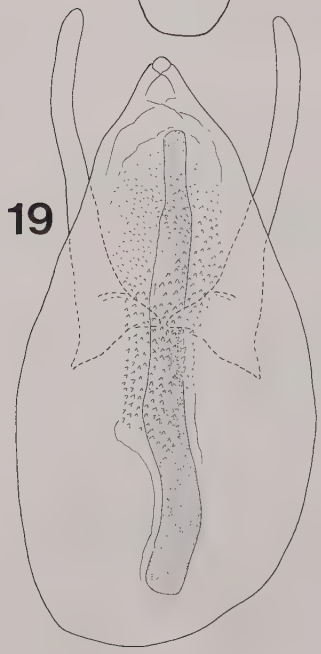

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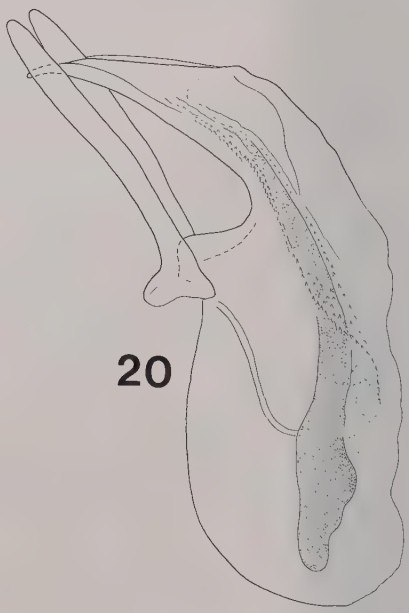

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BIOLOGY. This species is very common in decaying hay and has been collected in all months except November to January, March, and June.

4. *Scaphisoma convexum* Say
(Figs. 7, 19, 20)

Scaphisoma convexum Say 1825:183.
Scaphisoma convexa, Casey 1893:525; Blatchley 1910:496.

DIAGNOSIS. Length 1.8–2.8 mm. Body black, apices of elytra and abdomen yellow-red, legs and antennae pale yellow. Mesepimeron about equal to ½ length of meso-metasternal suture. Mesocoxal lines parallel and margined with punctures. Abdominal sternum I only with central punctures. Elytral punctation distinct.

Male. Parameres slender, length less than that of median lobe. Internal sac spinose.

REMARKS. Although size varies, specimens of this species are the largest in our area. The coarsely punctate metasternum and convex metacoxal lines are diagnostic.

NOTES ON TYPE MATERIAL. Say's original type of *S. convexum* has probably been destroyed. The LeConte collection (MCZ) is considered to be representative of the species described by Say. In one series in the LeConte collection, there are three males and two females of a large *Scaphisoma* species, of which one specimen is labelled "S. convexum Say," and agrees with Say's description. In another series under the name *Scaphisoma convexum,* there is one unidentified female *Scaphisoma,* one male of *Baeocera congener* Casey, and two *Caryoscapha americanum* Löbl. We consider the specimen bearing the old identification label of *S. convexum* Say to be representative of the species.

MATERIAL EXAMINED. CANADA. **Ontario:** 1, Brighton, 19.VII.77, I. Löbl; 1, Bells Corners nr. Ottawa, 19.VIII.1968, A. Smetana. **Quebec:** 3, Esterel, 8–13.VII.77, I. Löbl.

UNITED STATES. **Arkansas:** 1, Polk Co., Queen Wilhelmina State Park, 2,500′, 11–12.IX.1974, A. Newton; 1, Logan Co., Mt. Magazine, 17 mi. S. of Paris on Hwy. 309, Electronic Site, 9.IV.1986, R.A.B. Leschen. **Louisiana:** 4, Grand Parish, 18 km N. Alexandria, Stuart Lake Camp, 19.V–17.VIII.83, S. & J. Peck, forest FIT; 1, Grand Parish, 28 km N. Alexandria 19.V.–17.VIII.83, M. Kaulbars. **New York:** 1, N.Y. (MCZ). **Oklahoma:** 10, Latimer Co., X.87 and VII.87 K. Stephan. **Pennsylvania:** 1, Pen (MCZ). **Texas:** 12, San Jacinto Co., 5 km S. Coldspring, Double Lake Camp, 22.V–16.VIII.83, S. & J. Peck, forest FIT. **Virginia:** 2, Shenandoah Co., 16 km S. Strasburg, Elizabeth Furnace, 12.V.–22.VIII.83, S. & J. Peck, forest FIT.

DISTRIBUTION. Canada: Ontario and Quebec. United States: Arkansas, Georgia, Indiana, Louisiana, New York, Oklahoma, Pennsylvania, Texas, and Virginia.

BIOLOGY. This is the most abundant species of *Scaphisoma* in our area, and adults are often collected on fungi, sifted from forest litter, and taken in flight intercept traps. Adults are known to be present from February to December.

FUNGUS HOSTS. Agaricales: *Amanita* sp., Nov. (1); *Armillariella mellea,* Sept. (3); *A. tabescens,* Sept. (2); *Lactarius* sp., June (1); *Marasmius* sp., June

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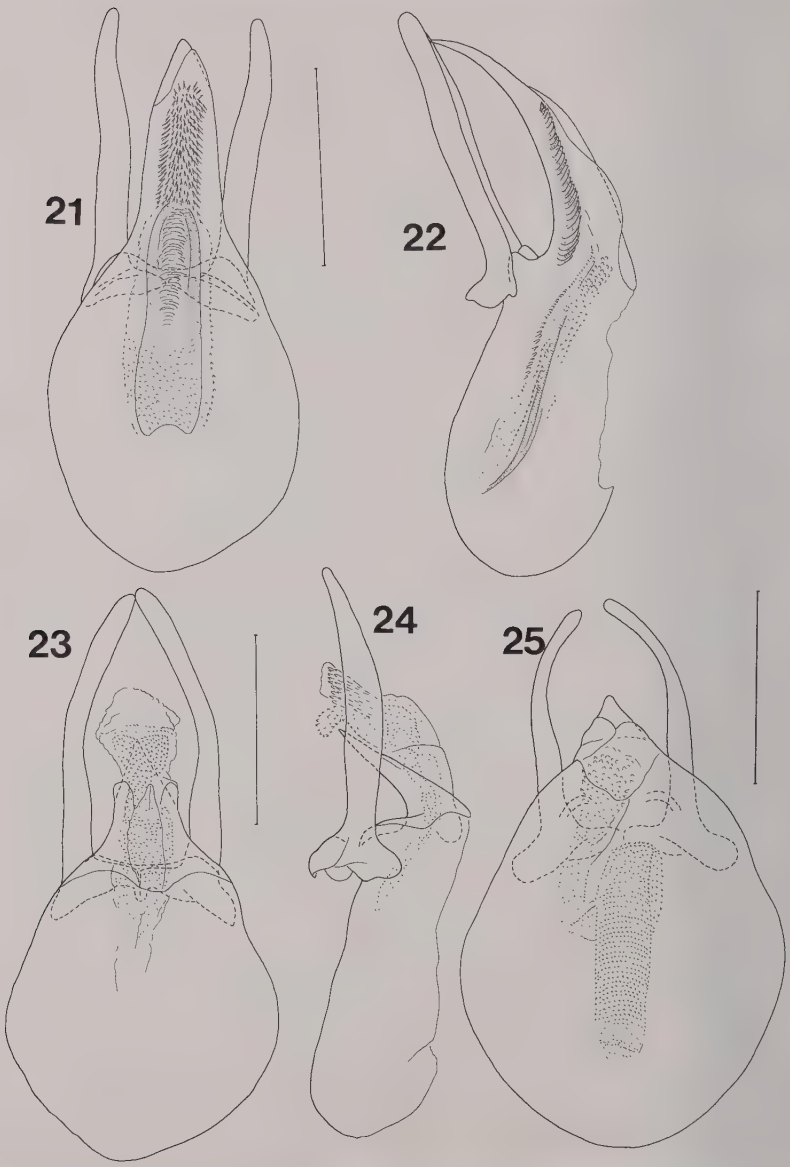
Figs. 17–20. *Scaphisoma* spp., aedeagi, dorsal and lateral views. 17, 18, *S. pusillum.* 19, 20, *S. convexum.* Scale bars: 17, 18 = 0.1 mm; 19, 20 = 0.2 mm.



Figs. 21–25. *Scaphisoma* spp., aedeagi, dorsal and lateral views. 21, 22, *S. suturale,* 23–25, *S. impunctatum,* (23, 24, with internal sac extruded; 25, with internal sac intact). Scale bars = 0.2 mm.

(6); *M. siccus,* June (6); *Omphalotus oleolaris,* Sept. (7); *Phylloporus rhodoxanthus,* June (1); *Pleurotus ostreatus,* Aug. (1), Sept. (7); *Strobilomyces floccopus,* Sept. (2); *Xerampelina* sp., May (1). Polyporales: *Bjerkandra adusta,* May (1); *Phoeleus schweinetzii,* March (2), Sept. (5); *Schizopora paradoxa,* April (1); *Spongipellis pachydon,* May (2); *Trametes cervinus,* Sept. (5); *T. versicolor,* April (1); *Tyromyces* sp., July (8).

Scaphisoma convexum has been reared once from the polypore *Tyromyces* (Leschen, unpubl. data).

5. *Scaphisoma suturale* LeConte
(Figs. 6, 21, 22)

Scaphisoma suturale LeConte 1860:323. Type material: Lectotype (here designated), male, labelled: S. suturale/TYPE 6638 (MCZ).
Scaphisoma suturalis, Casey 1893:527; Blatchley 1910:496.

Diagnosis. Length 2.0–2.2 mm. Body black to red-brown; apices of elytra and abdomen, legs, and antennae pale yellow. Mesepimeron longer than ½ length of meso-metasternal suture. Mesocoxal lines parabolic with indistinct marginal punctures. Metasternum with punctures in central and posterior areas. Metepisternal suture weakly arcuate in the posterior half. Metacoxal lines convex to slightly sinuate, postcoxal area shallow. Abdominal sternum I with fine punctures and, in most specimens, microsculpture consisting of transverse lines. Elytral punctation distinct.

Male. Parameres slender, length less than that of median lobe. Internal sac with posterior canal, apical portion spinose.

Remarks. Specimens of this species resemble those of *S. convexum,* but are smaller, have longer mesepimera, and parabolic mesocoxal lines.

Material Examined. **Arkansas:** 2, Newton Co., Lost Valley nr. Ponca, 1,000′, 23–24.X.1974, A. Newton. **Indiana:** 1, Indiana Amer. bor. **New York:** 2, Highland, 14.VII.77, I. Löbl.

Distribution. Arkansas, Indiana, Missouri, and New York.

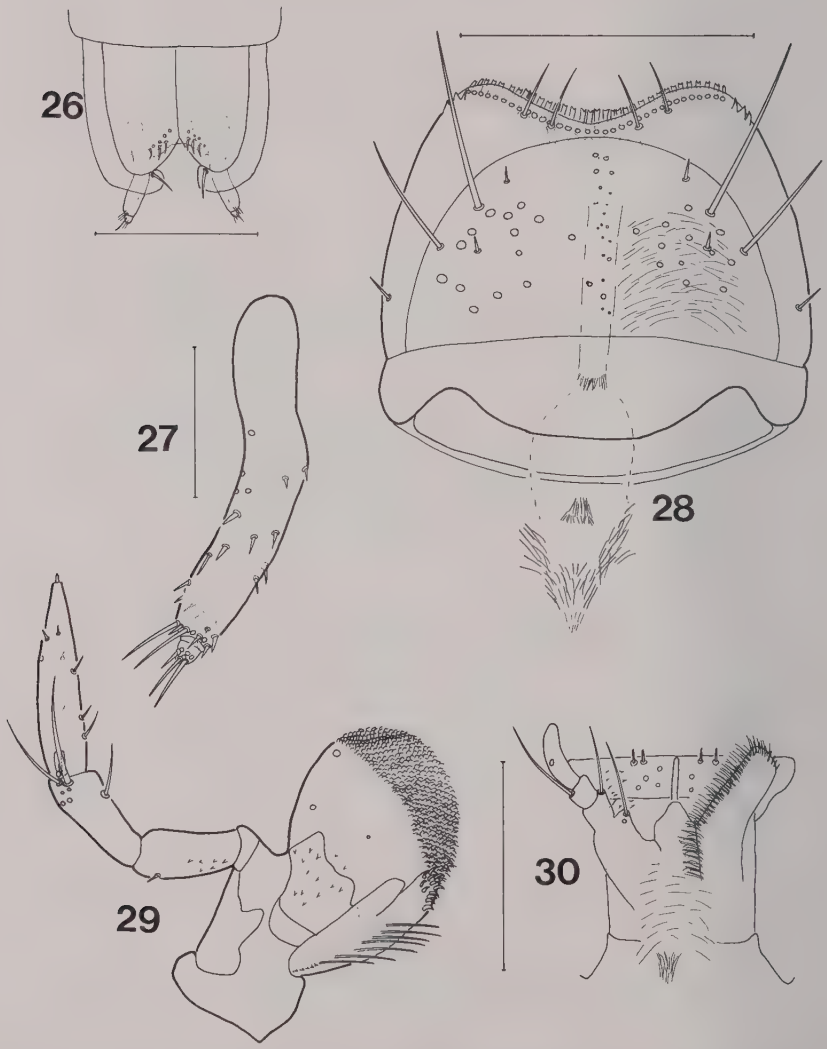
Biology. Specimens of this species are rarely collected in our area. Adults have been sifted from leaf litter and collected from fungi in March, June, July, and October.

Fungus Host. Polyporales: *Irpex lacteus,* March (1).

6. *Scaphisoma impunctatum* Reitter
(Figs. 8, 23–25)

Scaphisoma impunctatum Reitter 1879:46. Type material: Lectotype (here designated), female, labelled: impunctatum m. Missouri Am. b/TYP. REITTER/MUSEUM PARIS Coll generale/TYPE/impunctatum (MNHP).
Scaphisoma obesula Casey 1893:531. Type material: Lectotype (here designated), male, labelled: Enterprise lav Fla/Casey bequest 1925/TYPE USNM 48763 (USNM). Paralectotype, male, same, but bearing a label: obesula-2 Paratype USNM 48763 (USNM). **New synonymy.**

Diagnosis. Length 1.8–2.1 mm. Body black; apices of elytra, legs, and antennae pale yellow. Mesepimeron less than ⅓ length of meso-metasternal suture. Mesocoxal lines parabolic, not margined with punctures. Metasternum smooth. Metepisternal suture almost straight. Metacoxal lines convex to sinuate, postcoxal area shallow. Abdominal sternum I smooth, without microsculpture and coarse punctures. Elytral punctation indistinct.



Figs. 26–30. *Scaphisoma stephani,* new species. 26, female, segments VIII-X, dorsal view. 27, detail of gonocoxite. 28, labrum with superimposed internal view of the epipharynx, food groove and functional mouth. 29, maxilla, internal dorsal view. 30, labium, internal dorsal view, with superimposed hypopharynx: left side, labial palpus; right side, superlingua. Scale bars: 26, 28–30 = 0.01 mm; 27 = 0.005 mm.

Male. Parameres slender, length less than that of median lobe, basal articulations broad. Internal sac spiral in vertical plane, spinose.

REMARKS. The small mesepimeron, often hidden by the posterior pronotal angle, is diagnostic for this species.

MATERIAL EXAMINED. **Arkansas:** 5, Washington Co., Lake Wedington, 12 mi. W. of Fayetteville, 12.VI.1987, ex *Tremellodendron pallidum,* R. Leschen; 1, Garland Co., Camp Clearfork, 3 mi. W. of Crystal Springs off Hwy 270, 16.VI.1986, ex *Tremellodendron pallidum,* R. Leschen. **Mississippi:** 3, Claiborne Co., 19 km NEP+, Gibson Owens Creek mi. 52, 18.V.–16.VIII.1983, S. & J. Peck, forest FIT. **Oklahoma:** 6, Latimer Co., XI.1982, VII.1985, IX.1985, I.1986, XII.1986, K. Stephan.

DISTRIBUTION. Arkansas, Florida, Missouri, and Oklahoma.

BIOLOGY. This species is uncommon and has been collected by sifting forest litter and has been reared from fungus. It occurs from May to January.

FUNGUS HOSTS. Agaricales: *Lactarius subvellereus,* June (1). Aphyllophorales: *Tremellodendron pallidum,* June (see Leschen 1988).

7. *Scaphisoma stephani* Leschen and Löbl, **new species** (Figs. 2, 9, 26–34)

DIAGNOSTIC CHARACTERS. Metepisternal suture strongly arcuate in posterior half, metacoxal lines sinuate.

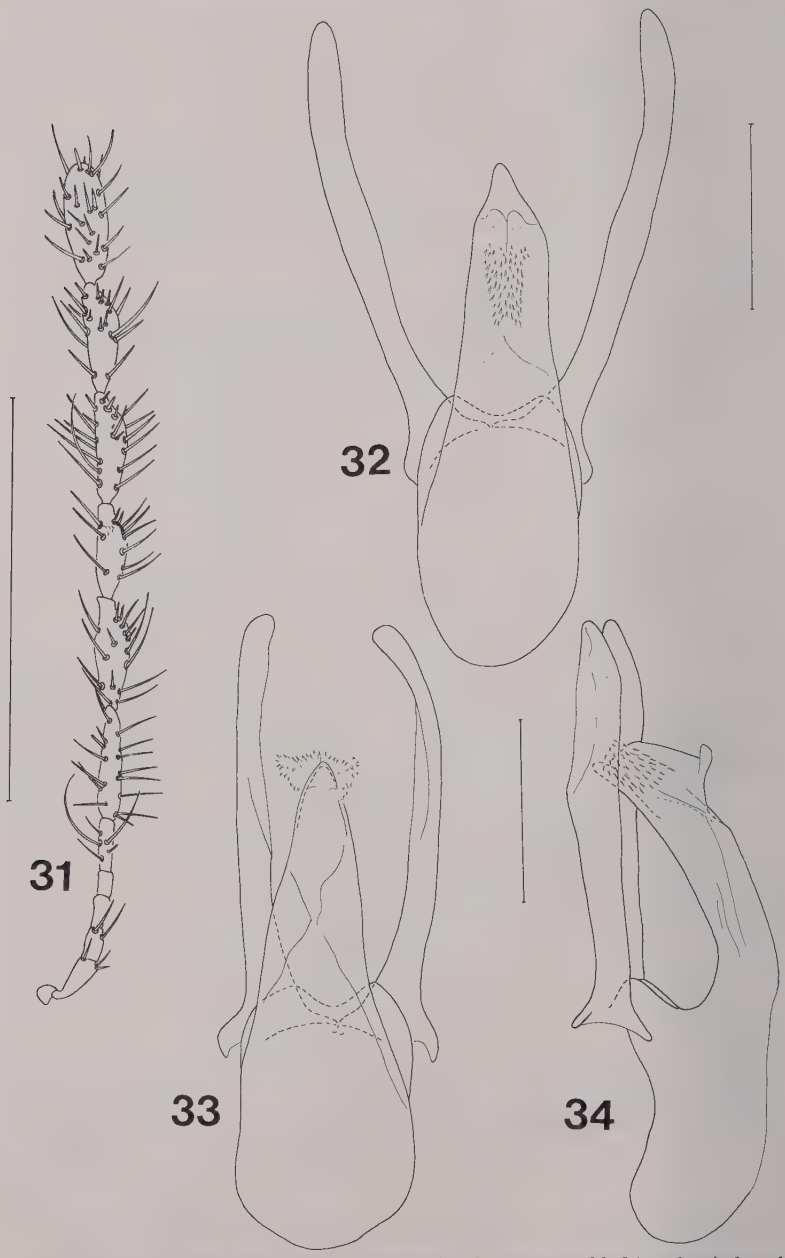
DESCRIPTION. Length 1.7–2.1 mm. Body black; apices of elytra and often of abdomen, legs, and antennae pale yellow. Antenna (Fig. 31) long, slender; antennomere IV short; surfaces not rugose, setose. Eyes large, not notched. Epistomal suture present, straight. Labrum (Fig. 28) short, weakly emarginate, margined with flattened bifid setae. Epipharynx (Fig. 28) with anterior ducts, large lateral pores, smaller medial pores, lateral areas with setal fields. Mandibles similar to those of *S. impunctatum* (Fig. 1) with apices acute, without subapical teeth; basal molar lobes with moderately developed ridges; prosthecae well developed, composed of slender bifid and simple setae. Lacinia (Fig. 29) with apical spurs, mesal setae, and basal asperities; galea flattened and oval with field of bent bristles. Maxillary palpus with three segments, third not securiform. Hypopharynx (Fig. 30) with well-developed superlinguae bearing fine setae. Prementum transverse and straight-edged; labial palpigers free, apical segment longer than basal two combined. Mentum square. Pronotum dome-shaped with marginal bead; posterior angles acute, extended behind level of mesepimeron; punctures fine, scattered. Scutellum not visible. Elytra with lateral stria curved near base, sutural stria extended along basal margin to humeral angle, punctures scattered and larger than those on pronotal disc. Mesepimeron (Fig. 9) shorter than ½ length of meso-metasternal suture. Metasternum with central area not vaulted, finely and sparsely punctate, medio-apical portion flattened and sparsely punctate, coarsely punctate on posterolateral areas. Mesocoxal lines arcuate, margined with punctures. metepisternum narrowed anteriorly, widened and strongly arcuate in posterior half. Legs long and slender, tibiae each with two apical spurs, empodial setae absent. Profemur with single row of fine setae. Abdominal sternum I coarsely punctate, sterna II–VI finely punctate. Metacoxal lines arcuate, margined with punctures.

Male (Figs. 32–34). Parameres long and slender, subequal in length to median lobe. Internal sac with apical spines.

Female (Figs. 26, 27). Segment IX with three posteriorly projecting setae and four glandular pits on each side. Gonocoxites bar-like with numerous setae and glands.

TYPE MATERIAL. *Holotype male.* **Arkansas.** Faulkner Co., Bell Slough Wildlife Management Area, Mayflower nr. Lake Conway spillway, 24.VIII.1986, ex *Meripilus giganteus,* R.A.B. Leschen (SEMC).

Paratypes. **Arkansas** (all collected by R. Leschen): Garland Co.: (2 ♂♂, 1♀) Camp Clearfork, 3 mi. W. of Crystal Springs off Hwy. 270, 20.VI.1986, ex



Figs. 31–34. *Scaphisoma stephani*, new species. 31, antenna. 32–34, aedeagi, dorsal and lateral views (34, with internal sac extruded). Scale bars: 31 = 0.5 mm; 33, 34 = 0.01 mm.

Meripilus giganteus (RALC). Logan Co.: (3 ♂♂) Cove Lake, 9 mi. SW of Paris on Hwy. 309, 8.XI. 1986, ex *Trametes cervinus* (MHNG, SEMC); same (1♀) 27.XI.1986, ex *Bjerkandra adusta* (MCZ); (3 ♀♀) Mt. Magazine, Slocum Spgs., 13.V.1986, ex *Phellinus* sp. (UAIC). Scott Co.: (3 ♂♂, 4 ♀♀) Hwy. 71, 1.5 mi. N. of Boles, 27.IX.1986, ex *Pleurotus ostreatus* (RALC, MHNG). Washington Co.: Fayetteville, (3 ♂♂, 1 ♀) 4.IX.1986, ex *Laetiporus sulphureus* (RALC, USHM); same (1 ♂, 2 ♀♀) 10.IX.1986, ex *Armillariella tabescens* (FMNH); (1 ♂) Markham Hill, Fayetteville, 10.XI.1986, ex *Pleurotus ostreatus* (SEMC); Lake Wedington, 12 mi. W. of Fayetteville (2 ♀♀) 26.X.1986, ex polypore (SEMC), (2 ♀♀) 6.V.1986 ex *Trametes versicolor* (MCZ). **Georgia:** (8 ♀♀) Effingham Co.: Ebenezer Cr., 7 mi. NE of Rincon, 9.VIII.1987, (ex *Trametes versicolor, Polyporus brasiliensis,* Thelophoraceae, *Schizopora paradoxa*) (RALC, MHNG). **Oklahoma** [all collected by K. Stephan; all (KSC) unless noted]: Latimer Co. (county labels only): (1 ♂) V.82, (1 ♂) X.82, (3 ♂♂, 3 ♀♀) VIII.84, (1 ♂) IX.85, (1 ♀) VII.86, (1 ♂) V.87, (4 ♂♂, 4 ♀♀) VII.87, (1 ♂) X.87, (1 ♀) XI.88; 5 mi. W. of Red Oak (1 ♂) 9.XII.76, (1 ♀) 16.X.77, (2 ♂♂, 4 ♀♀) IX.80; Red Oak, (1 ♀) 3.X.76), (1 ♀) 9.X.76, (1 ♀) 15.IX.1977 (MHNG), (1 ♀) IX.1980 (MHNG), (2 ♂♂, 3 ♀♀) VIII.1984 and XII.1986 (MHNG). **Texas:** (1 ♂) San Jacinto Co.: 5 km S. of Coldspring, Double Lake Camp, 22.V–16.VIII.1983, S. & J. Peck, forest FIT (MHNG). **Virginia:** (1 ♂, 2 ♀♀) Bull Rem Mts., "Broad Rem," 6.IX.1974, P. Zwick (MHNG).

Etymology. We name this species in honor of our colleague, friend, and third author, Karl Stephan, for his contributions to the knowledge of North American Coleoptera.

Distribution. Arkansas, Georgia, Illinois, Oklahoma, Tennessee, Texas, and Virginia.

Biology. Commonly collected from fungi, sifting forest litter and rotting wood. Adults occur from April to December.

Fungus Hosts. Agaricales: *Armillariella tabescens*, Sept. (8); *Pleurotus ostreatus,* June (1), Sept. (7), Nov. (1). Aphyllophorales: *Merulius incarnatus,* June (1), Oct. (2); Thelophoraceae (undetermined), Aug. (1). Polyporales: *Bjerkandra adusta,* Nov. (1); *Laetiporus sulphureus,* Sept. (7); *Meripilus giganteus,* June (1), Aug. (1); *Perenniporia compacta,* Oct. (1); *Phellinus* sp., May (3); *Polyporus brasiliensis,* Aug. (1); *Schizopora paradoxa,* April (1), Aug. (2); *Trametes cervinus,* Sept. (1); *T. versicolor,* May (2), Aug. (3), Sept. (1).

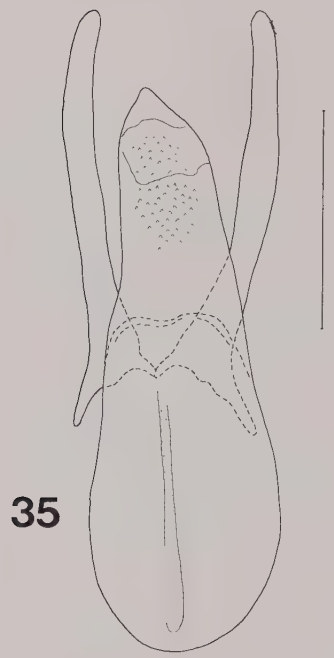
8. *Scaphisoma terminatum* Melsheimer
(Figs. 10, 35, 36)

Scaphisoma terminatum Melsheimer 1846:104; LeConte 1860:323. Type material: Lectotype (here designated), male, labelled: Melsh/terminatum (MCZ). Paralectotypes, 3 females, labelled: Melsh/terminatum (MCZ); two are conspecific with the lectotype, one is *Scaphisoma rubens* Casey.

Scaphisoma terminata, Casey 1893:527; Blatchley 1910:496; Fall 1910:118.

Scaphisoma evanescens Casey 1893:528. Type material: Lectotype (here designated), male, labelled: Ia/Casey bequest 1925/TYPE USNM 48762/ evanescens (USNM). Paralectotype: sex not determined, labelled: L/Casey determ. evanescens 2 (USNM). **New synonymy.**

Baeocera punctipennis Blatchley 1910:494. Type material: Lectotype (here designated), male, labelled: Wells Co. Ind. W. S. B. 9-24-05/3840/Holo./B. punctipennis Blatchley 1930/S. blatchleyi Achard Cornell 1965 (PERC). Paralectotypes, 3 females, labelled: 3033/Laws Co. Ind. W. S. B. 5-30-05/S. blatchleyi Achard Det. by J. F. Cornell 1969; Crawford Co. Ind.



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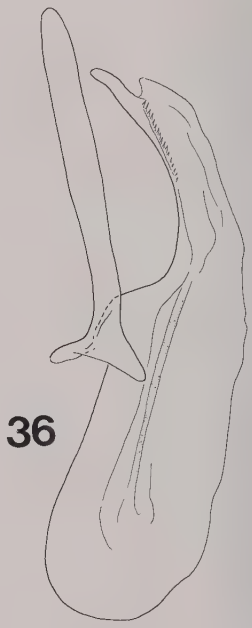

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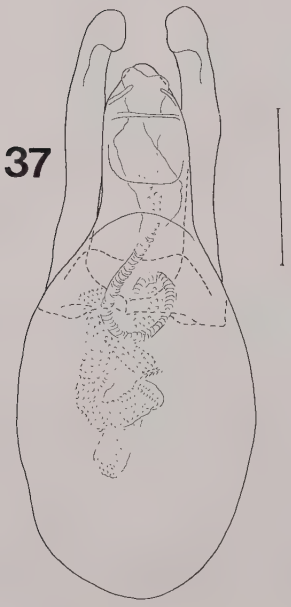

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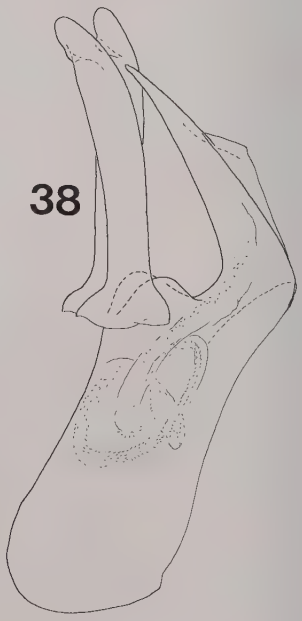

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P. 5-25-04/same; Marion Co. Ind. W. S. B. 11-28-09/same but det. 1965 (PERC). **New synonymy.**

Baeocera blatchleyi Achard 1915:292. Replacement name for *Baeocera punctipennis* Blatchley, not *Baeocera punctipennis* Matthews 1888. **New synonymy.**

Scaphisoma blatchley (Achard), Cornell 1957:3.

DIAGNOSIS. Length 1.4–1.9 mm. Body black; broad apices of elytra and often of abdomen, legs, and antennae pale yellow. Mesepimeron shorter than ½ length of meso-metasternal suture. Mesocoxal lines convex with indistinct marginal punctures. Metasternum with fine punctures. Metepisternal suture arcuate in posterior half. Metacoxal lines sinuate and margined with punctures. Abdominal sternum I with fine punctures. Elytral punctation distinct.

Male. Parameres slender and elongate, length less than that of median lobe. Internal sac poorly developed with apical spines.

REMARKS. This species is characterized by having the length of the mesepimeron shorter than ½ the length of the meso-metasternal suture, the mesocoxal lines convex, and the metacoxal lines sinuate.

MATERIAL EXAMINED. **Arkansas:** 1, Washington Co., Lake Wedington, 12 mi. W. of Fayetteville on Hwy. 16, 19.IV.1986, ex *Schizopora paradoxa,* R. Leschen. 1, Garland Co., Camp Clearfork 3 mi. W. of Crystal Springs, 20.VI.1986, ex *Merulius incarnatus,* R. Leschen. **Kentucky:** 1, Rowan Co., 24 km SW Morehead, Cave Run Lake, 14.V.–20.VIII.1983, S. & J. Peck, Fagus forest FIT. **Oklahoma:** 2, Latimer Co., Red Oak, 15.IX and 9.X.1976, K. Stephan; 5, Latimer Co., I-V.1983, K. Stephan.

DISTRIBUTION. Arkansas, Florida, Indiana, Iowa, Kansas, Kentucky, Missouri, Ohio, Oklahoma, and Texas.

BIOLOGY. This species is very common on fungi, in addition to being sifted from leaf litter and rotting wood and collected in flight intercept traps. It has been collected in all months except January, March, and November.

FUNGUS HOSTS. Agaricales: *Naematoloma* sp., Sept. (1). Aphyllophorales: *Auricularia auricula,* Aug. (25); *Merulius incarnatus,* June (5), July (1), Sept. (1); *Schizophyllum commune,* May (2). Thelophoraceae (undetermined), Aug. (1). Polyporales: *Laetiporus sulphureus,* Sept. (2); *Meripilus giganteus,* June (1), Aug. (1); *Phellinus gilvus,* May (2); *Polyporus brasiliensis,* Aug. (1); *Schizopora paradoxa,* April (1), June (4); *Trametes versicolor,* May (2), Aug. (1); *Tyromyces* sp., June (1).

Scaphisoma terminatum was reared once from *Merulius incarnatus* (Leschen, unpubl. data).

9. *Scaphisoma punctulatum* LeConte
(Figs. 11, 37, 38)

Scaphisoma punctulatum LeConte 1860:323. Type material: Holotype, female, labelled: S. punctulatum LeC./TYPE 6637 (MCZ).

Scaphisoma punctulata, Casey 1893:526.

DIAGNOSIS. Length 2.0–2.2 mm. Body black; apices of elytra and abdomen narrowly yellow-red, venter, legs, and antennae pale yellow. Mesepimeron longer than ½ length

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Figs. 35–38. *Scaphisoma* spp., aedeagi, lateral and dorsal views. 35, 36, *S. terminatum.* 37, 38, *S. punctulatum.* Scale bars = 0.1 mm.

of meso-metasternal suture. Mesocoxal lines parabolic without marginal punctures. Metasternum with fine punctures. Metepisternal suture weakly arcuate in posterior half. Metacoxal lines sinuate to convex with marginal punctures, postcoxal area shallow. Abdominal sternum I with fine punctures and microsculpture consisting of points and meshes. Elytral punctation distinct.

Male. Parameres stocky, curved apically, length less than that of median lobe. Internal sac convoluted and spinose.

REMARKS. This species is characterized by having a reddish venter, the mesocoxal lines parabolic, and abdominal sternum I with fine microsculpture.

MATERIAL EXAMINED. **Oklahoma:** 3, Latimer Co., VI. 1983, IX.1986, XII.1987, K. Stephan.

DISTRIBUTION. Georgia, Florida, Missouri, and Oklahoma.

BIOLOGY. This species is rarely encountered and has been sifted from forest litter and reared from fungus.

FUNGUS HOST. Polyporales: *Schizopora paradoxa,* June (3).

The above rearing record, was briefly alluded to in an earlier study (Leschen 1988) in which these specimens were tentatively, and incorrectly identified as *S. convexum.*

DISCUSSION

Several species groups based on male sexual characters have been recognized for Palearctic and Australian species (Löbl 1970, 1971, 1977, 1979, 1981, 1986). Among Ozarkian *Scaphisoma, S. ornatum* belongs to the *haemorrhoidale* group (mostly Oriental species, but including *S. perkinsi* Scott from Hawaii) while all remaining Ozarkian species have unknown affinities. None of these species is linked by known synapomorphies with any of the Palearctic or Oriental species. However, they may represent a monophyletic group which is derived from Neotropical stock (Löbl, unpubl. data). Unfortunately, the species occurring south of the United States have not been adequately described, and the genitalia of Nearctic species have not been illustrated or described. The current knowledge of intrafamilial relationships of scaphidiids is based on general similarities. Natural groups are not defined by shared derived characters, so that any decisions about the evolution of scaphidiids are premature.

The Ozark species of *Scaphisoma* are an extension of the eastern United States fauna. Of the treated species, *S. suturale* is northern in distribution, while *S. ornatum* is southern. There are no distinct patterns of seasonality among our species, except that most specimens have been collected during the summer.

The biology of *Scaphisoma* has been discussed by Ashe (1984), Newton (1984), and Leschen (1988). *Scaphisoma ornatum, S. punctulatum,* and *S. suturale* are rarely collected in the Ozarks; their ecological relationships are poorly known. *Scaphisoma pusillum* and *S. carolinae* have not been collected from Basidiomycetes, suggesting that their habits and life histories differ from those of the remaining species. *Scaphisoma impunctatum,* although considered uncommon, has been reared in large numbers from its host fungus, *Tremellodendron pallidum* (Leschen 1988). *Scaphisoma punctulatum* is also known from only a few specimens, but has been reared from a polypore. This suggests that some *Scaphisoma* species that seem rare may actually only be inconspicuous due to their reproductive preference for specific fungi at limited times during the year.

Scaphisoma convexum, S. stephani, and *S. terminatum* are common on various Basidiomycetes. This may reflect a long breeding season on a wide

variety of fungal hosts. *Scaphisoma stephani* and *S. terminatum* are more common on polypores, as are many *Scaphisoma* species (Newton 1984). In contrast, *S. convexum* has been consistently collected from an equal number of polypores and agarics, with one rearing record from a polypore.

Acknowledgments

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JONATHAN MAWDSLEY[1]

The editor recently received the following letter (shortened and edited in some parts) from Jonathan.

"I would like to express my deep appreciation to the Coleopterists Society for presenting me with the first Youth Incentive Award. Here is a short synopsis of my project.

"Mimicry is one of the most interesting, most important and least studied aspects of the biology of the Cleridae. Numerous species in this family have evolved coloration patterns and body shapes; these resemble to a certain extent other insects species, which may be unpalatable to predators. I am currently compiling a review of all literature dealing with the topic of mimetic clerids to show the widespread occurrence of the phenomenon of mimicry. In addition, I will summarize my personal observations of four Virginia clerids, which may be involved in mimetic relationships.

"With the help of the Youth Incentive Award from the Coleopterists Society, I have been able to conduct direct observations on captive adults of one species of clerid, *Enoclerus ichneumoneus* Fabricius, and record many details on adult biology, including mating and feeding behavior. I plan to publish these observations independently of my mimicry paper.

"I thank the Coleopterists Society for assisting me with my work."

Jonathan Mawdsley
Route 2, Box 62
Lynchburg, VA 24501, U.S.A.

[1] We sincerely apologize to Jonathan for misspelling his name in the minutes of the last annual meeting (see Coleopts Bull. 44:117).

The Coleopterists Bulletin, 44(3):295–303. 1990.

OREODYTES OBESUS (LECONTE) AND *O. SANMARKII* (C. R. SAHLBERG) (COLEOPTERA: DYTISCIDAE) IN NORTH AMERICA

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Abstract

Discriminant analyis revealed that three recognizable taxa within the *Oreodytes sanmarkii-obesus* complex occur in western North America. The form occurring in the arctic Yukon Territory and Northwest Territories is considered conspecific with northern European specimens of *O. sanmarkii* (C. R. Sahlberg), while the two more southern taxa are considered subspecies of a single species, *O. obesus* (LeConte). The subspecies *O. o. obsesus* occurs in western Washington, Oregon and California, while specimens from Colorado to the southern Yukon Territory and west to British Columbia and eastern Washington are assigned to *O. obesus cordillerensis,* new subspecies.

Sharp (1882:449) began a century of confusion regarding the status of *Oreodytes obesus* (LeConte 1866). He noted that the Palaearctic species, *O. rivalis* (Gyllenhal 1827) [a junior subjective synonym of *O. sanmarkii* (C. R. Sahlberg 1826)], was variable in color, marking and punctation over its European range, but that he was not able to find grounds to subdivide the taxon. In addition, he noted that some European specimens resembled North American specimens previously known as *O. obesus,* thus he synonymized the two names. Subsequently, some workers, such as Zimmermann (1920), Leng (1920), Hatch (1953), Larson (1975) and Zimmerman (1985), accepted this synonymy, generally with reservations. Fall (1923) considered *O. obesus* to be distinct from *O. sanmarkii,* but admitted uncertainty as to species limits within the complex. Hatch (1933) separated Nearctic *O. obesus* from the Palaearctic *O. sanmarkii,* but later (Hatch 1953) recognized both species in North America. Hatch's (1953) *O. rivalis* is equivalent to *O. rivalis sensu* Larson (1975) and *O. r. rivalis sensu* Zimmerman (1985), while his *O. obesus* equals *O. r. obesus sensu* Zimmerman (1985). Zimmerman (1985) revised the North American species of *Oreodytes* and defined most of the North American taxa of the genus, but he did not deal with the *O. sanmarkii-obesus* complex in northwestern Canada nor did he address the problem of the relationships between the Old and New World faunas.

A number of northern dytiscids have Holarctic distributions (*e.g.* Larson and Nilsson 1985), but most such species occur in lentic habitats. Few lotic species, such as the ovate species of *Oreodytes* (*O. angustior* group *sensu* Zimmerman 1985), have such broad ranges and many are confined to a single physiographic region. Thus, the holarctic distribution of *O. sanmarkii* also seemed unusual.

Material and Methods

In order to investigate patterns of variation, several series of specimens from representative localities throughout the range of the *O. sanmarkii-obesus* com-

plex were studied. Localities and repositories of the principal series examined are:

ITALY—Lazio (Roma), 2 km nw Subiaco [19 specimens, JBWM (J. B. Wallace Museum, University of Manitoba)];
NORTHERN EUROPE (N.EUR)—specimens pooled from Sweden (18), England (5), Holland (3), Germany (2) [CAS (California Academy of Sciences), CNC (Canadian National Collection), JBWM and MUN (Memorial University of Newfoundland)];
NORTHERN YUKON TERRITORY (N.YT)—Caribou Bar Creek, tributary of Porcupine R., w Old Crow (24, CNC);
SOUTHERN YUKON TERRITORY (S.YT)—South Liard, Liard River (10, MUN); e end Little Salmon L., Drury Park (10, MUN);
BRITISH COLUMBIA (BC)—Shingle Creek, Penticton (20, MUN);
ALBERTA (AB)—Waterton Lakes National Park (20, MUN);
OREGON (OR)—Curry Co., several localities (37, MUN, JBWM); and
CALIFORNIA (CA)—Humboldt Co, Redwood Cr. (22, JBWM).

Specimens were seen from many other localities, but only those of special significance are mentioned below. These specimens were compared for structural characters, including those of the male genitalia, and for the following quantitative characters:

L = Length;
L/W = Length/maximum width of body;
MF/MT = Length of metafemur/length of metatrochanter measured from its apex to apex of metacoxal process; and
WH1/WH2 = Maximum width of head across eyes/minimum distance between eyes.

Measurements were made with an ocular micrometer to the nearest 0.01 mm. Linear discriminant analysis was carried out using the Discriminant program of Minitab.®

Results

Descriptive statistics for the four quantitative characters for selected population samples are presented in Table 1. The pattern of variation in each of these characters is described below.

Length (L)—European specimens are significantly larger ($P < 0.01$) on average than specimens from most North American populations, although specimens from N.YT and along the eastern slopes of the Rocky Mountains are of comparable size [*e.g.* Alberta, $\bar{x} = 2.95$ mm (0.08) (Larson 1975); Wyoming, $\bar{x} = 3.03$ mm (0.11) (Zimmerman 1985)]. Specimens from OR and CA are significantly smaller than those from other localities.

Length/Width (L/W)—Narrowest specimens are from N.YT; N.EUR specimens are slightly broader, but narrower than those from ITALY, S.YT, BC and AB. Broadest specimens are from OR and CA. Fall (1923) noted this difference between European and North American specimens, stating European specimens were less convex.

Length metafemur/length metatrochanter (MF/MT)—Length of the metafemur is greater relative to the length of the metatrochanter in European and N.YT specimens than in the more southerly North American specimens ($P <$

Table 1. Measurements and ratios for selected population samples of *Oreodytes obesus* and *O. sanmarkii*. Values for Wyoming specimens are from Zimmerman (1985) and west central Alberta ones from Larson (1975). Measurement and locality abbreviations as in text.

Locality (n)	L	L/W	MF/MT	WH1/WH2
ITALY (19)	3.06 (0.11) 2.81–3.26	1.68 (0.04) 1.60–1.77	2.39 (0.08) 2.25–2.53	1.59 (0.03) 1.53–1.65
NORTHERN EUROPE (29)	2.98 (0.11) 2.81–3.18	1.72 (0.04) 1.63–1.83	2.41 (0.06) 2.27–2.54	1.59 (0.03) 1.55–1.65
MONGOLIA (3)	3.00–3.11	1.72–1.77	2.34–2.38	1.58–1.67
YT, Caribou Bar Cr (24)	2.93 (0.09) 2.78–3.15	1.76 (0.03) 1.72–1.81	2.53 (0.07) 2.39–2.71	1.56 (0.02) 1.51–1.61
NWT, Southampton I (3)	2.81–3.03	1.73–1.82	2.56–2.67	1.54–1.57
YT, Dawson City (2)	2.89–2.89	1.66–1.77	2.12–2.23	1.58–1.62
YT, Upper Liard (20)	2.79 (0.07) 2.62–2.89	1.68 (0.03) 1.62–1.73	2.19 (0.08) 2.08–2.32	1.57 (0.03) 1.53–1.63
BC, Penticton (20)	2.90 (0.11) 2.70–3.03	1.65 (0.03) 1.60–1.72	2.17 (0.07) 2.00–2.31	1.60 (0.03) 1.54–1.64
AB, Waterton Pk (20)	2.82 (0.10) 2.63–3.00	1.65 (0.03) 1.61–1.70	2.19 (0.05) 2.10–2.28	1.56 (0.03) 1.51–1.64
AB, west central (20)	2.95 (0.08) 2.80–3.08	1.68 (0.02) 1.61–1.72	—	—
WY	3.03 (0.11) 2.87–3.03	1.69	—	—
OR, Curry Co. (37)	2.56 (0.07) 2.44–2.70	1.57 (0.02) 1.53–1.63	2.15 (0.07) 2.03–2.29	1.61 (0.04) 1.54–1.68
CA, Humboldt Co. (22)	2.65 (0.05) 2.55–2.78	1.57 (0.03) 1.52–1.62	2.14 (0.05) 2.05–2.23	1.61 (0.03) 1.54–1.66

0.01). The southern (S.YT and south) North American specimens do not differ significantly among themselves.

Width of head across eyes/width between eyes (WH1/WH2)—In dorsal aspect, the eyes of European and some North American specimens are prominent, convexly protruding from the lateral margin of the head. However, the head ratio did not differ significantly between populations.

Multivariate Analysis. The above four characters were used together in a discriminant analysis to see if clearer resolution of population affinities could be obtained than with the univariate analyses described above. Squared distance statistics (D^2) for paired comparisons of samples are presented in Table 2. Increasing values for D^2 indicate increasing dissimilarity.

The S.YT, AB and BC samples differ little among themselves (1.1 to 3.1), are about equally distant from European (14.9 to 18.9) and OR and CA (12.7 to 17.7) specimens and are maximally distant from N.YT (34.0 to 41.5) specimens. The OR and CA specimens are very similar and together differ strongly from European and N.YT specimens. In the same way, N.EUR and ITALY specimens are similar between themselves and show considerable difference from all North American samples except those from N.YT. The classification summary of Table 3 also shows these patterns of relationship for it is between the most similar samples that classification mistakes occur. Correct classifi-

Table 2. Squared distance (Mahalanobis Distance) between group centers calculated through discriminant analysis. Locality abbreviations as in text.

	ITALY	N.EUR	N.YT	S.YT	BC	AB	OR	CA
ITALY	—							
N. EUROPE	3.0	—						
N.YT	14.4	7.2	—					
S.YT	18.9	15.6	34.0	—				
BC	14.9	16.5	41.5	3.1	—			
AB	17.0	17.0	36.5	1.1	2.3	—		
OR	49.4	49.1	77.2	16.8	17.7	15.0	—	
CA	41.8	44.2	74.1	14.7	12.7	11.7	1.0	—

cation of members of the Oregon-Idaho and European samples is relatively high, indicating the distinctiveness of these groups.

Qualitative Characters

COLOR AND PUNCTATION. As noted by many authors, these characters vary both between and within populations. Maculations vary in color from black to pale brown and may be either sharply delimited or rather diffuse. Elytral maculation may consist of narrow, continuous vittae or the vittae may be broken into a number of spots, or broadly expanded and fused so that the elytral disk is largely or completely black. Because color and punctation are difficult to quantify and show both inter- and intrapopulation variation, these characters were not carefully studied.

SHAPE. Variation in lateral curvature of the eye occurs, but was not captured with the measurement system used. On average, the eye of each European, N.YT, OR and CA specimen is more convex in outline than the lateral margin of the head and therefore protrudes slightly. The lateral margin of the eye of each specimen from S.YT, BC and AB is on average noticeably flat. The shape of the pronotum is somewhat varied, but in general the pronotum of each North American specimen (excluding N.YT) is broader basally and forms a more or less continuous curvature with the elytra in dorsal aspect, while European and N.YT specimens have the posterolateral angles of the pronotum

Table 3. Summary of specimen placement in discriminant function classification. Locality abbreviations as in text.

	ITALY	N.EUR	N.YT	S.YT	BC	AB	OR	CA
ITALY	13	5	0	0	0	0	0	0
N. EUROPE	4	20	1	0	0	0	0	0
N.YT	0	2	23	0	0	0	0	0
S.YT	0	0	0	13	2	5	0	0
BC	2	0	0	2	15	5	0	0
AB	0	1	0	5	3	10	2	1
OR	0	0	0	0	0	0	27	3
CA	0	0	0	0	0	0	8	18
Total n	19	28	24	20	20	20	37	22
n correct	13	20	23	13	15	10	27	18
% correct	68	71	96	65	75	50	73	82

broadly rounded and usually distinctly discontinuous in curvature with the elytra. Body shape differences are indicated by the ratio L/W.

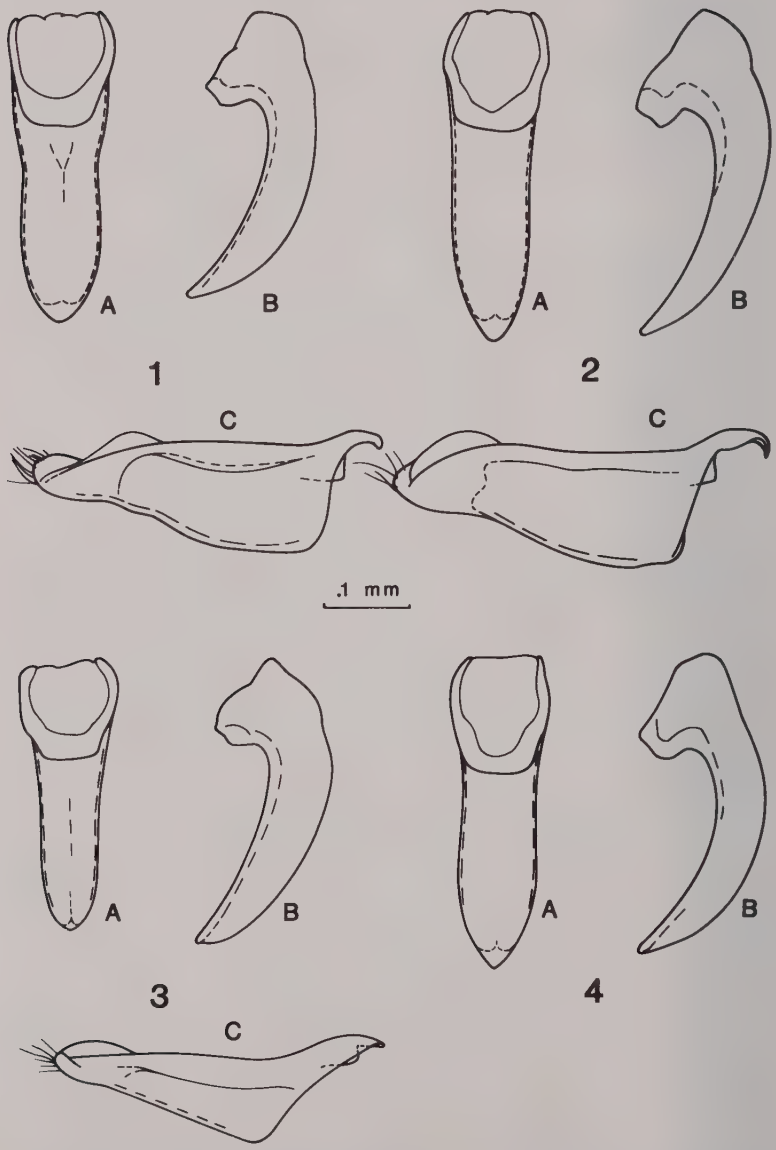
METATROCHANTER. The metatrochanter of European and N.YT specimens is conspicuously and rather closely punctate on the posteroventral surface with these punctures bearing conspicuous, elongate, white hairs. Other North American specimens have the metatrochanters much more finely and sparsely punctate, each puncture with a small and more or less inconspicuous hair.

MALE GENITALIA. The paramere of North American specimens is narrower apically than that of European specimens (Figs. 1C, 2C, 3C). Laterally the paramere bears a broad impression which is limited ventrally by a sharp longitudinal ridge. This ridge is most pronounced and heavily sclerotized in S.YT, BC and AB specimens. The aedeagus of European (Fig. 2) and N.YT (Fig. 4) specimens is slightly longer (in part related to larger average size), more arcuate in lateral aspect, and in ventral aspect the lateral margins are more or less straight. The aedeagus of specimens from S.YT (Fig. 1), BC and AB has the lateral margins slightly but distinctly constricted medially in ventral aspect. The aedeagi in specimens from OR (Fig. 3) and CA are relatively short, blunt and with sides subparallel in ventral aspect.

DISCUSSION

Both the quantitative and qualitative characters provide ample evidence of three more or less distinct taxa within the complex. In spite of considerable variation in color and some in size and shape, European specimens are relatively homogeneous and the present practice of treating all as members of the species *O. sanmarkii* is supported by the limited analysis of this study. The N.EUR specimens are as similar to ITALY specimens as they are to N.YT specimens indicating that this North American population belongs to *O. sanmarkii*. ITALY and N.YT specimens are rather dissimilar, but this is not surprising considering the wide geographical separation and the difference in environments. The intermediate position of N.EUR specimens suggests the variation is probably clinal.

Within North America, two additional groups exist: (OR + CA); and (S.YT + BC + AB). These represent the taxa described below as *O. obesus obesus* LeConte and *O. obesus cordillerensis,* new subspecies [= *O. rivalis obesus* and *O. r. rivalis,* respectively of Zimmerman (1985)]. The evidence suggests that these groups are not conspecific with *O. sanmarkii*. The *O. o. cordillerensis* group is equally distinct from the taxa *O. o. obesus* and the European *O. sanmarkii*. However, the *O. sanmarkii* population in closest proximity to *O. o. cordillerensis* populations (N.YT) differs most from *O. o. cordillerensis* populations so that differences between these two taxa are accentuated in or close to the region of geographical contact. This could be an example of character displacement, but as well the N.YT population of *O. sanmarkii* could represent the extreme end of a cline that occurs across the Palaearctic Region. However, three Mongolian specimens (CAS) are similar to N.EUR specimens (Table 1). Genetic exchange may occur between *O. sanmarkii* and *O. o. cordillerensis* in the Yukon as this is suggested by two female specimens from an intermediate locality, Klondike R., Dawson City, YT (JBWM). These specimens are similar to those of *O. o. cordillerensis* (Table 1), but one is unusually narrow and both have the pronotum discontinuous in outline with that of the elytra. The hind leg characters are those of *O. obesus*. In spite of the potential of limited hybridization between North American *O. sanmarkii* and *O. o. cordillerensis,* I



Figs. 1–4. *Oreodytes* spp., male genitalia. 1, *O. obesus cordillerensis,* Yukon Territory, Upper Liard. 2, *O. sanmarkii,* Sweden. 3, *O. o. obesus,* Oregon, Curry Co. 4, *O. sanmarkii,* Yukon Territory, Caribou Bar Creek. A = aedeagus, ventral aspect; B = aedeagus, lateral aspect; C = paramere, lateral aspect.

feel the pattern and relative magnitude of difference between these populations justifies regarding the taxa as specifically distinct.

Although the objective was not to reanalyze geographical variation patterns within the southern North American range of the complex, inclusion of the samples from Oregon and California reinforced Zimmerman's (1985) conclusion that these specimens are distinct from specimens from more northern and eastern localities. In addition to the characters used by Zimmerman to separate these two taxa, specimens from OR and CA have the metacoxal plates much more coarsely and densely punctate than specimens from farther north and east. Because of the broad zone of hybridization between these forms reported by Zimmerman, two subspecies should be recognized. The type of *O. obesus* is from California, thus the name of the southwestern subspecies is *O. o. obesus* while the northern and eastern subspecies lacks a subspecific name. I propose the following name to replace *O. r. rivalis sensu* Zimmerman.

Oreodytes obesus cordillerensis Larson, **new subspecies**

Hydroporus rivalis; Leng 1920:78 (in part); Fall 1923:119–120 (in part); Hatch 1953:213; Larson 1975:323–324.
Hydroporus obesus; Hatch 1933:24; Hatch 1953:213 (both in part).
Oreodytes obesus; Anderson 1962:64.
Oreodytes rivalis rivalis; Zimmerman 1985:112–113.

Description. Provided by Zimmerman 1985:112-113, figs. 9, 61–63 (as *O. rivalis rivalis*) and augmented by Larson 1975:323–324, figs. 5, 129 (as *Hydroporus rivalis*); and character analysis for samples S.YT, BC and AB of this paper. Color various, but most specimens with elytral vittae piceous to black, sharply defined and complete, vitta 1 complete (not broken postmedially), majority of specimens without a small ancillary vitta between vitta 1 and suture on apical half although a diffusely darkened region may be present: some specimens with vittae expanded and disc largely black (*e.g.* French R., BC—9 of 24 specimens with elytra mainly black). Metacoxal plate with punctures very sparse and shallow.

Etymology. The name is based on the cordilleran physiographic region, within which the subspecies has a wide distribution.

Type Material. HOLOTYPE: male, Yukon Territory: YT, Liard River, Upper Liard, 19 July 1987, D. Larson family. ALLOTYPE: same locality and date. PARATYPES: **Yukon Territory:** same locality and date as holotype (18); Jct. Alaska Hwy. and Albert Cr., nr Cassiar Jct., 19 July 1987, D. Larson (5); Canol Road, Sheldon L., 26 July 1987, Carr and Larson (3); Drury Park, Little Salmon L., 30 July 1987, Carr and Larson (20). **British Columbia:** French R. at Hwy 37 Jct., 17 July 1987, Carr and Larson (24); Beady Cr, north end Dease L., 16 July 1987, Carr and Larson (11).

The holotype, allotype and some paratypes will be deposited in the CNC. Additional paratypes will be deposited in the CAS and the United States National Museum of Natural History.

Distribution. The range of *O. obesus cordillerensis* extends along the Rocky Mountains from Colorado to central Yukon Territory and west to the Pacific Ocean in British Columbia and Washington (Zimmerman 1985, fig. 84). The species is replaced in the arctic and subarctic by *O. sanmarkii*.

Ecology. These beetles occur on gravel to rocky substrates in eddies and areas of slow flow of clear streams and along exposed shorelines of large cold lakes. Larvae occur with adults during July and August. The ecological distri-

bution in relation to that of other sympatric riparian *Oreodytes* has been discussed by Larson (1985).

Oreodytes obesus obesus (LeConte 1866)

Hydroporus obesus LeConte 1866:365. Sharp 1882:449; Fall 1923:119–120; Hatch 1933:24; Hatch 1953:213 (all in part).
Hydroporus rivalis; Leng 1920:78 (in part).
Oreodytes obesus; Leech and Chandler 1956:319.
Oreodytes rivalis obesus; Zimmerman 1985:113–115.

DIAGNOSIS. Provided by Zimmerman 1985:113–115.

DISTRIBUTION. Western California and Oregon. According to Zimmerman (1985), intergradation with the taxon *O. o. cordillerensis* occurs in northern Oregon and Washington.

Oreodytes sanmarkii (C. R. Sahlberg 1826)[1]

Hyphydrus sanmarkii C. R. Sahlberg 1826:172–173.
Hyphydrus rivalis Gyllenhal 1827:385.
Oreodytes rivalis; Balfour-Browne 1940:249–252 (discussion of variation and species limits). Zaitsev 1953:186 (description and Palaearctic distribution).
Oreodytes sp. *cf. obesus*; Young 1960:275.

DIAGNOSIS. Very similar to *O. obesus cordillerensis*, but on average narrower, pronotum with lateral margin not continuous in curvature with elytra in dorsal aspect, hind angles more rounded, and metafemur longer relative to metatrochanter (Table 1). In addition, specimens of *O. sanmarkii* differ from all other ovate North American *Oreodytes* species by the possession of relatively densely punctate and setose metatrochanters.

DISTRIBUTION. The range extends across the low arctic and subarctic portions of the Palaearctic Region, and south along mountain chains. Known in North America from two localities in the western low arctic, namely: **Yukon Territory:** Caribou Bar Cr. nr. Old Crow (67°30′N, 140°30′W) (24, CNC). **Northwest Territories:** Coral Harbour, Southampton Island (3, CNC) (Young 1960, as *O.* sp. *cf. obesus*).

ACKNOWLEDGMENTS

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COLEOPTERISTS SOCIETY ANNUAL MEETING

The 1990 annual meeting of the Coleopterists Society will be held in conjunction with the Entomological Society of America meeting at New Orleans, LA, at the New Orleans Hilton Riverside and Towers on Monday, 3 December. After a short business meeting, Margaret Thayer and Al Newton will talk on "Surveying south temperate staphylinid forms: beetles, bites, beyond."

Please check the E.S.A. program for further details. *Between 75 and 100 members and guests are usually present, so we hope you will join us.*

SCIENTIFIC NOTE

Observations on the Intertidal Staphylinid, *Micralymma marinum* (Stroem) (Coleoptera: Staphylinidae), from Newfoundland

The staphylinid beetle, *Micralymma marinum* (Stroem), occurs within crevices of rocks and under rocks in the intertidal zone of the northern Atlantic Ocean (Steel 1958; Thayer 1985). While *M. marinum* has been well studied in Europe (Elliott *et al.* 1983; Steel 1958, 1970; Thayer 1985), its North American distribution and biology are poorly known (Thayer 1985). Therefore I undertook a study of its habitat preferences at Bonne Bay (49°31′N, 57°52′30″W), Gulf of St. Lawrence, Newfoundland.

Methods

The coast of Newfoundland provides many good areas of suitable habitat for these beetles, which occur in crevices of both shale bedrock and erratic boulders, as well as under large stones and other debris. Seaweed was abundant in the *M. marinum* habitat, with *Fucus vesiculosus* and *Ascophyllum nodosum* being the dominant species. The seaweed was located mainly between neap low tide and neap high tide levels. The mean tidal amplitude for this area is 1.3 metres. The study was carried out from April 27 to May 2, 1988, and May 3 to 10, 1989.

Ten sites of apparently suitable habitat were selected in the Bonne Bay area; six of these were along protected shoreline while four were exposed to the open ocean. Within each site, four 10 m transects parallel to the water line were laid out at the following levels: low tide, ⅓ tide, ⅔ tide and at high tide. Each transect was sampled for one hour. Sampling was conducted along a transect by locating rock crevices and opening them using a geological hammer and cold chisel or by turning stones and other shore debris. Habitat preference of the beetles toward protected or exposed shoreline was determined using a Mann-Whitney U test. At the laboratory, two beetles were placed in each of four Biological Oxygen Demand (BOD) bottles to examine their survival abilities while immersed in water. Two bottles were maintained at ambient seawater temperatures (approx. 2–4°C) while the remaining two bottles were kept at 14°C. One bottle at 14°C and one at 2–4°C were completely filled and stoppered to exclude air. Surface seawater temperatures during the study ranged from −0.5 to 4.0°C.

Results and Discussion

Elliott *et al.* (1983) showed the distribution of *M. marinum* in Europe as being confined to the intertidal zone at the mid-tide levels. Their figures show that the majority of insects occur slightly above the mid-tide level. My results corroborate these findings, except the majority occur slightly below the mid-tide level. No specimens were found along either the low tide or high tide transects (Table 1). Beetles may be excluded from the high tide habitat by predation from terrestrial animals and a low prey abundance. The low tide zone is immersed in water for extended periods and, since lack of air may be the limiting factor, it appears unfavourable as well. The mid-tide zone remains free of seawater for a period twice daily, thus allowing the beetles ample oxygen and time to search for food. Since no effort was made to identify prey items, their exact food preferences remains to be elucidated. Several adult beetles were observed outside of crevices during low tide on sunny days. Although air temperatures were cool (mean daily max. 11.1°C; min. 1.0°C), rocks exposed to direct sunlight were warmer, perhaps prompting the beetles to move around outside the crevices.

Beetle larvae found in cracks corresponded to descriptions by Steel (1970) and were assumed to be *M. marinum* since it is the only intertidal beetle known from Newfoundland. I did not search for eggs. The presence of third instar larvae (Steel 1970) early

Table 1. Number of specimens of *Micralymma marinum* (Stroem) collected along 10 meter intertidal transects (A = adult, L = larva).

Sample site	Exposure	Date	Transects			
			Low tide	⅓ tide	⅔ tide	High tide
Norris Cove	Protected	27/4/88	—	2A, 2L	2A —	—
Burnt Point	Protected	28/4/88	—	2A, 1L	1A —	—
Gadds Harbour	Exposed	29/4/88	—	7A —	10A —	—
Norris Point	Exposed	01/5/88	—	3A —	— —	—
Gadds Harbour	Exposed	02/5/88	—	1A —	3A —	—
Norris Cove	Protected	03/5/89	—	12A, 2L	5A, 1L	—
Norris Cove	Protected	04/5/89	—	5A, 2L	4A —	—
Gadds Harbour	Protected	07/5/89	—	17A —	11A, 1L	—
Needy Harbour	Protected	09/5/89	—	12A —	5A —	—
Wild Cove	Exposed	10/5/89	—	9A —	5A —	—
Totals			—	70A, 7L	46A, 2L	—

in the spring indicates that some specimens overwinter as larvae. These data support Thayer (1985), who suggested that some *M. marinum* in Maine have larval overwintering. This life cycle differs from that observed in western Europe by King *et al.* (1980, egg or adult overwintering) and Steel (1970, adult overwintering with eggs laid in May or June).

Micralymma marinum showed no preference in habitat. There was no significant difference in collections from protected shoreline over exposed shoreline ($P > .05$). Residing in crevices during high tide and periods of unsettling weather provides protection from the elements.

Two beetles placed in water at 14°C without air died within 4 days, while all remaining experimental beetles stayed alive for the duration of the experiment (Table 2). *Micralymma marinum* are able to trap a small quantity of air under their elytra (Elliott *et al.* 1983; King *et al.* 1980). Thus beetles immersed in warmer water would likely respire at a faster rate and use up the limited supply of air under the elytra, unless they have access to extra air. Topp and Ring (1988) consider the use of trapped air in crevices as a general feature of adaptation in marine, rocky shore insects. The amphi-Atlantic distribution of this beetle was probably the result of direct transport of seaweeds by ocean currents associated with the Gulfstream (Lindroth 1957). My results, along with those of Elliott *et al.* (1983), demonstrate the ability of *M. marinum* to survive extended periods submersed in cold water and help to support the above theory by Lindroth.

In conclusion, I found no evidence that *M. marinum* prefer sheltered or protected shoreline over exposed areas. The severity of exposure (*i.e.* heavy seas or scouring by ice) may have some impact on their choice of habitat. Within the intertidal zone, beetles are located at or slightly below the mid-tide level. The distribution of marine beetles in the intertidal zone depends on several factors; behaviour, competition, availability of food, along with physiological and morphological adaptations to such an environment.

Table 2. Survival abilities of *Micralymma marinum* while immersed in water.

Temperature (°C)	n	Treatment	Survival time (days)
2–4	2	air	9+
2–4	2	no air	9+
14	2	air	9+
14	2	no air	4

Acknowledgments

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CARINISPHINDUS, A NEW GENUS AND THREE NEW SPECIES OF NEOTROPICAL SPHINDIDAE (COLEOPTERA: CLAVICORNIA)

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ABSTRACT

Carinisphindus, a new genus of Sphindidae (Coleoptera: Clavicornia), is described. *Eurysphindus bicolor* Fisher is redescribed and reassigned to *Carinisphindus*. Three new species of *Carinisphindus* are described: *C. isthmensis* (Panama), *C. leptosphinctos* (Dominican Republic), and *C. platysphinctos* (Jamaica). A key to the species is provided.

RESUMEN

Se describe a *Carinisphindus*, un nuevo género de Sphindidae (Coleoptera: Clavicornia). Se redescribe a *Eurysphindus bicolor* Fisher y se la transfiere a *Carinisphindus*. Se describen tres nuevas especies de *Carinisphindus*: *C. isthmensis* (Panamá), *C. leptosphinctos* (República Dominicana), y *C. platysphinctos* (Jamaica). Se da una clave para las especies de *Carinisphindus*.

Eurysphindus bicolor Fisher (1936) from Cuba was described and assigned to *Eurysphindus* with reservation. Fisher was concerned because *E. bicolor* lacks the concave prosternal lateral flanges that occur in the type species, *Eurysphindus hirtus* LeConte (1878).

During a revision and phylogenetic analysis of the subfamily Eurysphindinae (McHugh, in press), it was clear that *E. bicolor* and three closely related undescribed species form a monophyletic group outside what has been considered Eurysphindinae (Fig. 2). The new group has the following synapomorphies: (1) clypeal margin weakly cleft, (2) male metafemur with a posterior tooth (Figs. 11, 12), (3) pronotum with a median longitudinal carina (Figs. 1, 8), (4) scutellum with a median longitudinal carina (Figs. 1, 15, 18), and (5) elytra with upturned inner edges anteriorly (Fig. 1). The genus *Carinisphindus* is described to include these four species.

MATERIALS AND METHODS

Specimens were studied with the following three techniques: (1) using a Wild M-5 stereoscopic microscope on alcohol-preserved and pin- or point-mounted specimens; (2) using a Leitz Nomarski optics microscope on specimens that had been disarticulated, cleared in hot KOH, and slide-mounted in glycerin jelly or Canada balsam; and (3) using scanning electron microscopy (SEM) on specimens sputter-coated with gold-palladium. During the course of this study, specimens were placed in Watrous-trays (Wheeler and McHugh 1987) for handling and storage.

Morphological illustrations were made with the aid of either a camera lucida or a gridded eyepiece and graph paper in concert with the above methods 1 and 2.

Fig. 1. *Carinisphindus platysphinctos,* new species, holotype male, Jamaica (Troy), dorsal view.

Standardized species descriptions were written using MDP (Monographic Database Program), a presently unreleased computer database system created by Dr. K. Nixon (Cornell University).

Morphometric measurements were made using a ZIDAS image analyzer (Zeiss, Inc.) to digitize images projected by a camera lucida. Measurements of the holotype are given under Type Material using the abbreviations shown in Figs. 3, 4. Measurements given under Description are arithmetic means in species descriptions and keys, and are ranges in the generic description, for all material examined. The units of measure are millimeters.

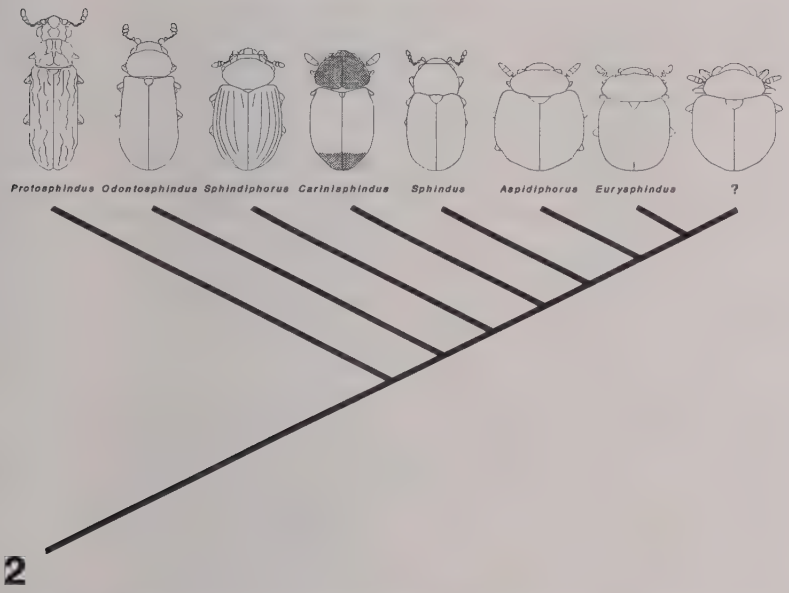


Fig. 2. Cladogram of sphindid genera (from McHugh, in press). "?" is an undescribed Neotropical genus.

The numbers on the distribution map symbols (Fig. 26) represent the number of specimens examined from each particular locality.

Carinisphindus McHugh, **new genus**

Type species: *Carinisphindus bicolor* (Fisher 1936), designated here.

DIAGNOSIS. Body narrowly oval (Fig. 1). Color uniformly dark brownish (Fig. 27) or with yellowish-brown and black color pattern (Figs. 1, 28–30). Head with 2 pairs of ventral antennal pits (Fig. 6), dorsal surface with punctures coalescing laterally forming grooves (Figs. 1, 5); clypeus weakly bilobed apically; mandibles bidentate. Antenna 10-segmented with 2-segmented club, antennomeres 9–10 about equal in length (Figs. 1, 7, 10). Pronotum with smooth lateral edge and median longitudinal carina (Figs. 1, 8); procoxal cavities nearly closed posteriorly (Fig. 9); prosternal process lacking a carina, posteriorly bilobed (Fig. 9). Mesosternal process flat, bilobed (Fig. 14). Each femur with rounded distal end (Figs. 1, 12), male metafemur each with a posterior spine (Figs. 11, 12). Scutellum small, oval-chordate, carinate (Figs. 1, 15, 18). Wings with 3 anal veins and an anal cell (Fig. 17). Elytral strial interspaces convex (Figs. 1, 20). Pygidium with two large, impunctate patches (Figs. 19, 25).

DESCRIPTION. Body narrowly oval, convex, head visible from above (Fig. 1). Length 1.0–2.2 mm. Color of body uniformly dark brownish (Fig. 27) or with yellowish-brown and black banded color pattern (Figs. 1, 28–30), body shiny. Setation of short, moderately dense to sparse (Fig. 1) hairs.

Head with a pair of dorsal antennal grooves extending from between antennal insertion and clypeus to beyond top of eyes, as well as several other shorter, less distinct grooves (Figs. 1, 5), ventrally with 2 pairs of well-defined antennal pits (Fig. 6), fron-

toclypeal suture arcuate (Fig. 5); dorsal surface shallowly punctured medially, punctures becoming more elongate and coalescing laterally, forming grooves (Figs. 1, 5); clypeus emarginate laterally (Figs. 1, 5), weakly bilobed apically; eyes black or brown, coarsely faceted (Fig. 1); antenna 10-segmented, with robust and asymmetrical antennomeres 1 and 2, antennomere 3 about 3 times as long as wide, 4 slightly elongate, 5–7 submoniliform, 8 wider than 3–7, 9–10 large, forming densely pubescent, compact club (Figs. 1, 7, 10); labrum slightly bilobed apically, nearly completely concealed by clypeus; mandibles robust, bidentate with characteristic tubercle and cavity of family.

Pronotum slightly narrowed in front, weakly rounded at sides, convex, flattened laterally with acute, smooth edge (Figs. 1, 8), flanges flat anteroventrally, with or without depressions, basal margin arcuate (Figs. 1, 8), with narrow, median carina extending from anterior to basal margin (Figs. 1, 8), surface with irregular, shallow punctures (Figs. 1, 8) and weak micropunctures. Procoxal cavities nearly closed posteriorly by lateral extensions of prosternal process and posterior extensions of each hypomeron (Fig. 9); prosternal process slightly raised, punctured, posteriorly with lateral flanges (Fig. 9). Mesosternum irregularly punctured, horizontal anteriorly, reflexed posteriorly (Fig. 14); mesosternal process flat, bilobed (Fig. 14); trochantins exposed. Metasternum inflated, punctured anterolaterally (Fig. 14). Legs long, slender (Figs. 1, 12). Coxae transverse. Femora sparsely setose, rounded at distal ends (Figs. 1, 12); male metafemur with posterior tooth at about one-third length (Figs. 11, 12). Tibiae weakly dilated apically, narrowed basally, with sparse, short setae, lacking spurs except for short crown distally (Fig. 12). Tarsi 5-5-5 female, 5-5-4 male, simple, with apical segment not as long as others combined except on male metatarsus (Fig. 12); tarsomeres with a tuft of setae ventrally; claws with a short, basal comb of spines. Scutellum small, transverse, ovalchordate, weakly margined, with strong, narrow, median carina (Figs. 1, 15, 18).

Elytra elongate, covering abdomen, weakly rounded at sides, tapered posteriorly, disk convex (Figs. 1, 20), with or without (Fig. 1) trace of subhumeral depression, strongly depressed opposite lateral margins of scutellum (Fig. 1), humeral calli weakly to moderately (Fig. 1) produced, epipleuron narrow and complete to basal margin of abdominal sternite 3 to 5; dorsal surface with one scutellary and 10 long punctate strial interneurs, punctures darkened or not, decreasing gradually in size posteriorly; strial interspaces convex (Figs. 1, 20) and with 1 or 2 rows of sparse (Fig. 1) to moderately dense (Figs. 20, 21) setae.

Abdomen with 5 visible sternites, sternite 1 about 1.5–3.0 times length of other sternites, 2–5 with a basal row of depressions (Fig. 13) or with a long, continuous depressed band, sternites not in same plane giving shingled appearance. Pygidium with two large, impunctate regions (Figs. 19, 25).

Etymology. Latin, "keeled Sphindus," in reference to the characteristic keel on the pronotum and scutellum.

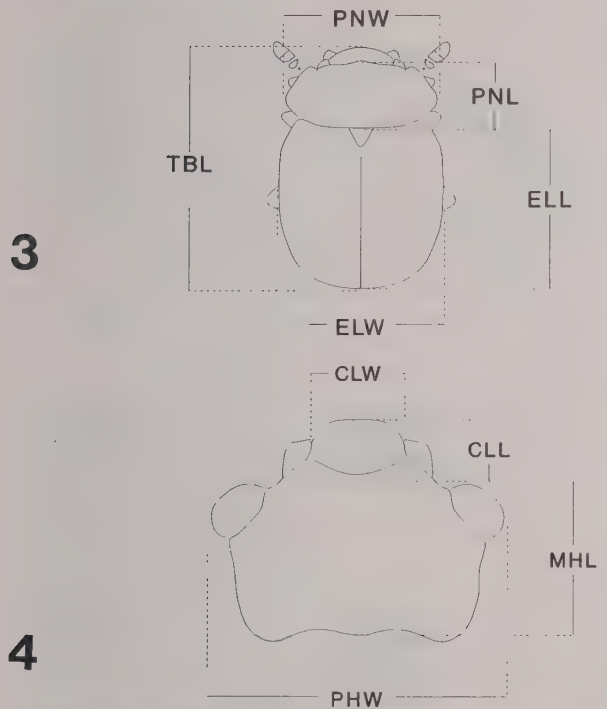
Natural History. All species apparently feed on myxomycetes.

Distribution. Central American and Caribbean.

Species Included. *Carinisphindus bicolor* (Fisher), new combination, transferred from *Eurysphindus,* Cuba; *C. isthmensis,* new species, Panama and Mexico; *C. leptosphinctos,* new species, Dominican Republic; and *C. platysphinctos,* new species, Jamaica.

Key to the Species of *Carinisphindus*

1. Body uniformly colored (Fig. 27) or nearly so, lacking a yellow and gray or reddish-black color pattern (Central America) ..... *C. isthmensis*
– Body with distinct yellow and gray or black color pattern with dark elytral apices and light basal elytral band (Figs. 1, 28–30) (Caribbean) 2
2. Head and pronotum reddish-yellow (Fig. 28), dorsolateral pronotal punctures with distinct posterior margin and weak, gradual anterior margin (Cuba) ..... *C. bicolor*



Figs. 3, 4. Morphometric measurements. 3, body measurements. 4, head measurements. Abbreviations: TBL = total body length, ELL = elytral length, ELW = elytral width, PNL = pronotal length, PNW = pronotal width, MHL = median head length, PHW = ocular head width, CLL = clypeal length, CLW = clypeal width.

– Head and pronotum dark reddish-black (Figs. 1, 29, 30), dorsolateral pronotal punctures with distinct margins anteriorly (Jamaica, Dominican Republic) 3

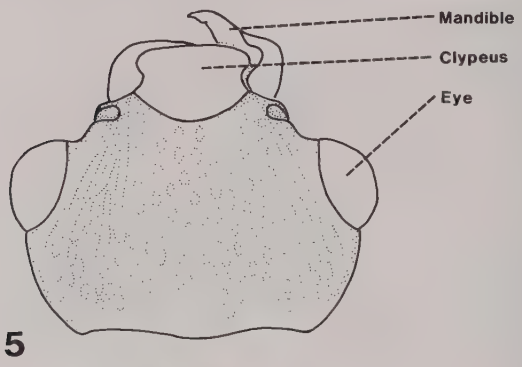
3. Yellow band on elytra wide (Figs. 1, 29), extending posteriorly about three-quarters length of elytra, head with small raised bump opposite apex of frontoclypeal suture, elytral punctures not darkened (Jamaica) ..... *C. platysphinctos*

– Yellow band on elytra narrow, not extending posteriorly beyond a quarter length of elytra (Fig. 30), head without raised bump opposite apex of frontoclypeal suture, elytral punctures darkened (Dominican Republic) ..... *C. leptosphinctos*

Carinisphindus bicolor (Fisher), **new comb.**
(Figs. 26, 28)

Eurysphindus bicolor Fisher 1936:201–202; Sen Gupta and Crowson 1977:183.

Diagnosis. Head and pronotum reddish-yellow, elytra yellowish on basal half and gray on apical half (Fig. 28); eyes black; antennomeres 9 and 10 about



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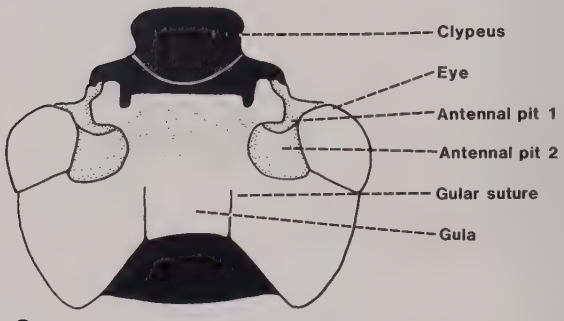

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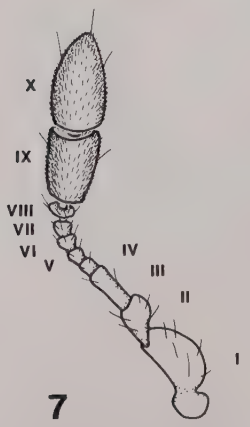

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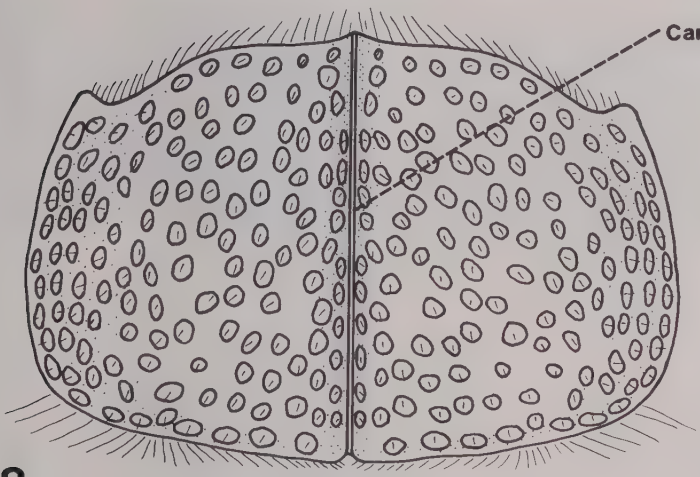
Figs. 5–7. *Carinisphindus isthmensis.* 5, head, dorsal view. 6, head, ventral view. 7, left antenna, dorsal view.



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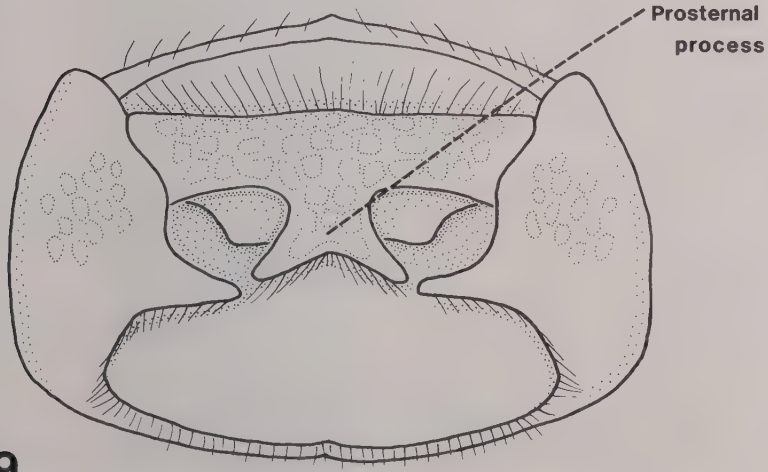

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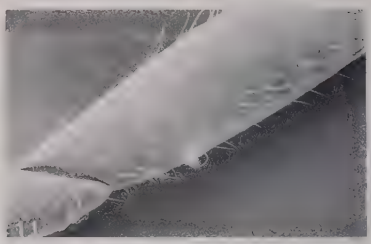
Figs. 8, 9. *Carinisphindus isthmensis,* prothorax. 8, dorsal view. 9, ventral view.

equal in length; lateral pronotal punctures with indistinct anterior margin; lacking paired pronotal depressions; elytra with weak subhumeral depression, punctures not darkened; basal depression on sternites 3–5 incompletely divided into rows of individual depressions.

Description. Length 1.7 mm. Color of head and pronotum reddish-yellow; elytra yellowish on basal half and gray on apical half (Fig. 28); prosternum, mesosternum, and metasternum light yellowish-brown; body very shiny. Setation of short, suberect hairs.



Figs. 10, 11. *Carinisphindus isthmensis*. 10, right antenna, dorsal view. 11, posterior tooth on male metafemur.

Head with dorsal surface sparsely and shallowly punctured medially, punctures elongate and coalescing laterally forming grooves; clypeus width 0.2, length 0.2; eyes small, black, coarsely faceted. Antennomere 3 about 3 times as long as wide; 4 slightly elongate; 5–7 submoniliform; 8 wider than 3–7; 9 and 10 large, about equal in length, symmetrical, and forming densely pubescent, compact club.

Pronotum width 0.7, length 0.5; surface with irregular, shallow punctures, lateral punctures with distinct lateral and posterior edges but anterior edges elongate and gradual. Mesosternum irregularly punctured, with anterior two-thirds horizontal, posterior third slightly reflexed; mesosternal process slightly bilobed.

Elytra width 0.3, length 1.1; with weak subhumeral depression and weakly produced humeral calli; epipleuron narrow, complete to about basal margin of sternite 5; surface with punctures decreasing gradually in size posteriorly; strial interspaces weakly convex with sparse, short setation.

Abdomen with sternite 1 about 3 times as long as other sternites; 2–5 basally depressed; 3–5 often with basal divisions of depression; intercoxal process with broad base, acute apex, and a weakly raised, broad, median ridge.

Type Material. Holotype: female (USNM) with following label data: "Baragua, Cuba, June 17, 1936, LCS Scaramuzza Feeding on a myxomycete on sugarcane E.E.A.Cuba, Ento. No, 10798 Type No. 51704 USNM Eurysphindus bicolor Fisher." Measurements: TBL 1.7, ELL 1.0, ELW 0.9, PNL 0.5, PNW 0.7, PHW 0.6, CLL 0.2, CLW 0.2. Paratypes: 2 females (USNM) with same label data as above except with paratype label (with same number as holotype) in place of holotype label.

Natural History. This species was collected feeding on an unidentified myxomycete occurring on sugar cane.

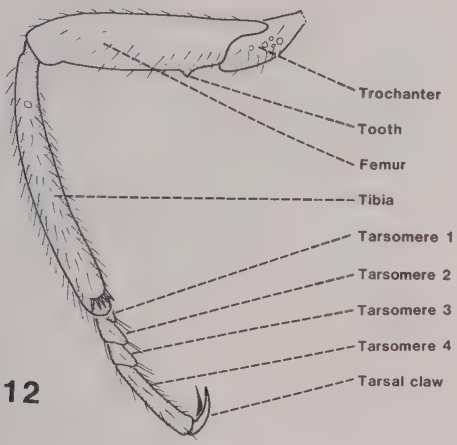
Distribution. Known only from the type locality in Cuba (Fig. 26).

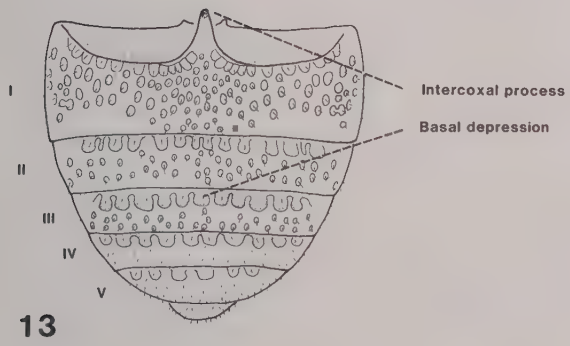
Although Fisher (1936) reported that his description was made from 6 specimens collected by Scaramuzza in Baragua on June 17, 1936, I have seen 9 specimens with that label data (USNM). Only two have paratype labels.

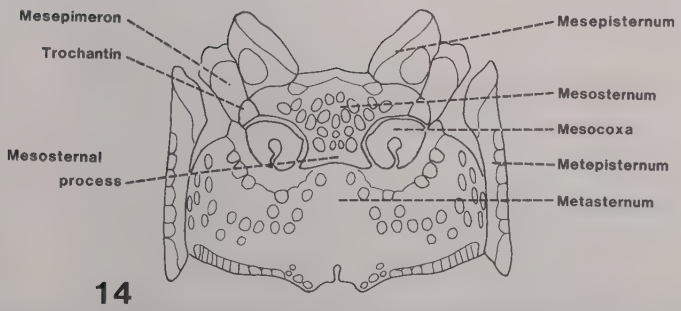
Carinisphindus platysphinctos McHugh, **new species**
(Figs. 1, 26, 29)

Diagnosis. Head and pronotum dark reddish-black, elytra yellow on basal three-quarters grading into reddish-black on apical quarter (Figs. 1, 29); eyes brown; antennomere 9 about half length of 10; pronotum with trace of paired pronotal depressions; elytra with weak subhumeral depression, punctures not darkened; depressions in basal rows on abdominal sternites 2–5 well defined.

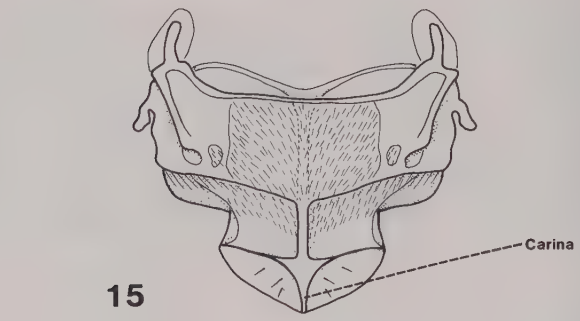
Description. Length 1.8 mm. Color of head and pronotum dark reddish-black; elytra yellow on basal three-quarters, grading into reddish-black on apical quarter (Figs. 1, 29);







Figs. 12–14. *Carinisphindus isthmensis.* 12, male left metaleg, anterior view. 13, abdomen, ventral view. 14, pterothorax, ventral view.



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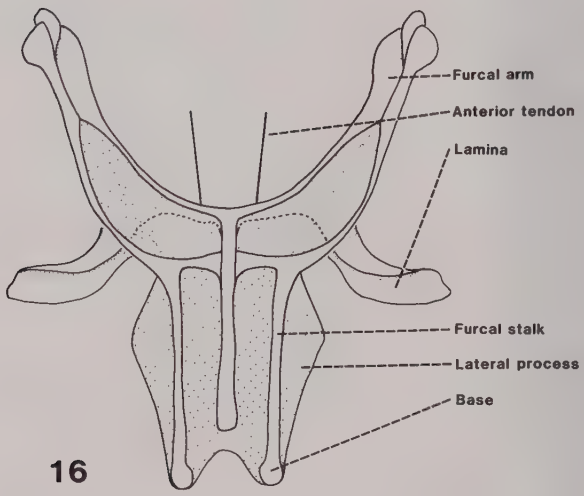

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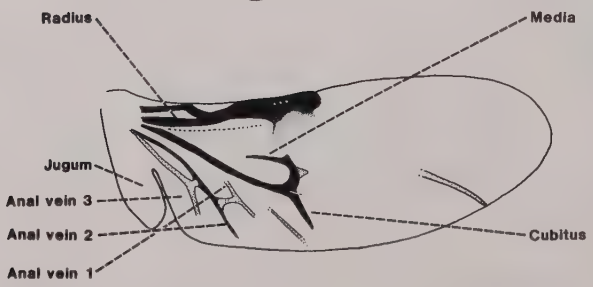

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Figs. 15–17. *Carinisphindus isthmensis.* 15, scutellum, dorsal view. 16, metendosternite, dorsal view. 17, right wing, dorsal view.

mesosternum, metasternum and abdomen yellow; prosternum reddish-brown; body very shiny. Setation of very short, sparse, inconspicuous hairs (Fig. 1).

Head with raised, weak, anteromedial bump opposite apex of frontoclypeal suture (Fig. 1); dorsal surface sparsely and shallowly punctured medially; punctures elongate, coalescing laterally forming grooves (Fig. 1); clypeus width 0.2, length 0.2; eyes small, brown, coarsely faceted (Fig. 1). Antennomere 3 about 3 times as long as wide, 4 slightly elongate; 5–7 submoniliform; 8 wider than 3–7; 9 and 10 larger, forming densely pubescent and compact club, 9 about half length of 10 (Fig. 1).

Pronotum width 0.8, length 0.5; with trace of paired depressions; surface with irregular, shallow punctures (Fig. 1). Prosternal process slightly raised, punctured; with weak, median anterior ridge extending to anterior margin of prosternum. Mesosternum irregularly punctured, anterior half horizontal, posterior half strongly reflexed.

Elytra width 0.9, length 1.0; with weak subhumeral depression and weakly produced humeral calli; inner edges of elytra reflexed anteriorly (Fig. 1); epipleuron very narrow and complete to about basal margin of sternite 4; surface with punctures decreasing gradually in size posteriorly (Fig. 1); strial interspaces convex with sparse, short, inconspicuous hairs.

Abdomen with sternite 1 about twice length of other sternites; depressions in basal rows on sternites 2–5 well defined; intercoxal process with broad base, blunt apex.

Type Material. Holotype: male (USNM) with following label data: "Jamaica, Troy, Feb 16, 37," "Sta 409, Chapin and Blackwelder." Measurements: TBL 1.8, ELL 1.0, ELW 0.9, PNL 0.5, PNW 0.8, PHW 0.6, CLL 0.2, CLW 0.2. Paratype: none.

Etymology. Greek, meaning "broad banded," in reference to the width of the yellow band on this beetle.

Distribution. Known only from the type locality in Jamaica (Fig. 26).

Carinisphindus leptosphinctos McHugh, **new species**
(Figs. 26, 30)

Diagnosis. Head and pronotum dark reddish-black, elytra yellowish on basal quarter and reddish-black on apical three-quarters (Fig. 30); eyes black; antennomeres 9 and 10 about equal in length; pronotum with a pair of depressions; elytra lacking subhumeral depression, punctures darkened; depressions in basal rows of abdominal sternites 2–5 well defined.

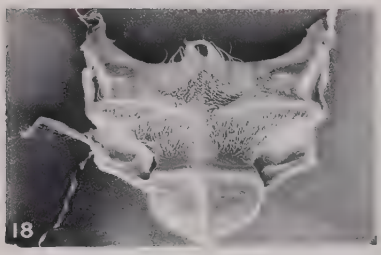
Description. Length 1.9 mm. Color of head and pronotum dark reddish-black; elytra yellowish on basal quarter, reddish-black on apical three-quarters (Fig. 30); prosternum, mesosternum, and metasternum reddish-brown; body very shiny. Setation of very short, sparse, inconspicuous hairs.

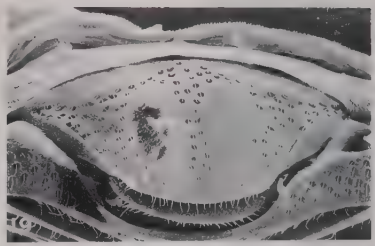
Head with dorsal surface sparsely punctured medially, punctures elongate and coalescing laterally forming grooves; clypeus width 0.2, length 0.2; eyes small, black, coarsely faceted. Antennomere 3 about 3 times as long as wide; 4 slightly elongate; 5–7 submoniliform; 8 wider than 3–7; 9–10 about equal in length, forming densely pubescent, compact club.

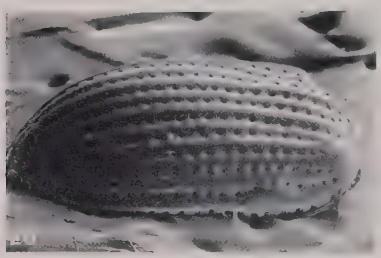
Pronotum width 0.8, length 0.6; with paired depressions; surface with irregular, shallow punctures medially, punctures slightly enlarged laterally and in row along basal margin. Mesosternum with anterior two-thirds horizontal, posterior third strongly reflexed.

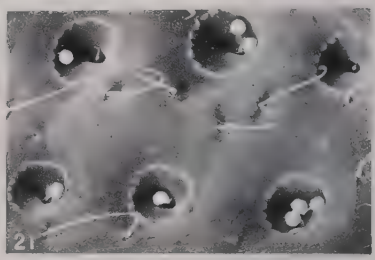
Elytra width 1.0, length 1.1; lacking a subhumeral depression; humeral calli weakly produced, inner edges of elytra reflexed anteriorly; epipleuron very narrow and complete to about middle of sternite 3; punctures darkened, decreasing gradually in size posteriorly; strial interspaces convex with sparse, short, inconspicuous hairs.

Abdomen with sternite 1 about twice length of other sternites; depressions in basal rows on 2–5 well defined. Abdominal intercoxal process broad at base, with blunt apex, raised medially as weak ridge.









Figs. 18–21. *Carinisphindus isthmensis*. 18, scutellum, dorsal view. 19, pygidium, posterodorsal view. 20, elytron, lateral view. 21, elytral surface (note: slime mold spores in punctures).

TYPE MATERIAL. Holotype: male (UCD) with following label data: "Samana, Rep Dom [=República Dominicana] VII 26 1978, ROSchuster." Measurements: TBL 1.9, ELL 1.1, ELW 1.0, PNL 0.6, PNW 0.8, PHW 0.6, CLL 0.2, CLW 0.2. Paratypes: 2 males and 3 females (CUIC, MAIC, MCZ), with following data: "DOM. REP.: Prov. Pedernales, ca. 35 km N. Cabo Rojo, 1,250 m, Las Abejas, 26 AUG–09 SEP 1988, flight intercept trap, M.Ivie, Philips & Johnson." 1 male (MAIC): "DOM. REP.: Prov. Pedernales, ca. 35 km NNW Cabo Rojo, 1,325 m, El Aceitillar, 9 SEP 1988, rotten pine log, M.Ivie, Philips & Johnson."

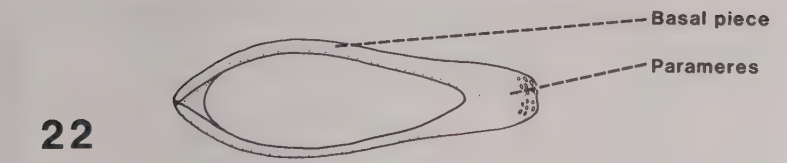
ETYMOLOGY. Greek, meaning "thin banded," in reference to the width of the yellow band on this beetle.

DISTRIBUTION. Known only from three locations in the Dominican Republic (Fig. 26).

Carinisphindus isthmensis McHugh, **new species**
(Figs. 5–27)

DIAGNOSIS. Head, pronotum, elytra dark reddish-brown (Fig. 27); eyes black; antennomeres 9–10 about equal in length (Figs. 7, 10); pronotum with a pair of weak depressions; elytra with weak subhumeral depression, punctures darkened; depressions in basal rows on abdominal sternites 2–5 well defined (Fig. 13).

DESCRIPTION. Length 2.0 mm. Color of head, pronotum, and elytra dark reddish-brown (Fig. 27); elytra sometimes slightly paler at basal margin and on humeral calli; prosternum, mesosternum, metasternum light reddish-brown; body shiny. Setation of short, suberect hairs.



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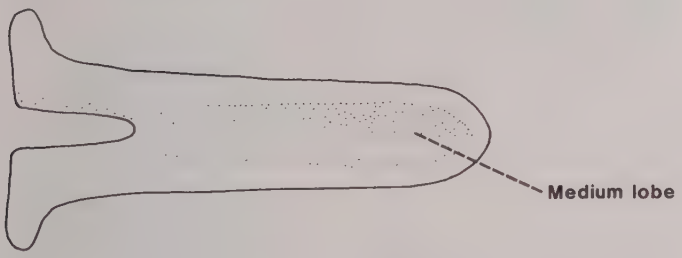

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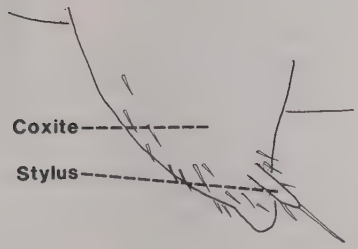

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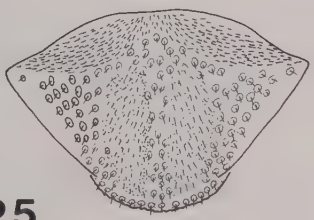

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Figs. 22–25. *Carinisphindus isthmensis*. 22, 23, male genitalia. 22, parameres (fused) and basal piece. 23, median lobe. 24, female genitalia, right coxite and stylus, ventral view. 25, pygidium, dorsal view.

Head with dorsal surface shallowly punctured medially, punctures becoming more elongate and coalescing laterally, forming weak grooves (Fig. 5); clypeus width 0.2, length 0.2; eyes small, black, coarsely faceted. Antennomere 3 about 3 times as long as wide; 4 slightly elongate; 5–7 submoniliform; 8 wider than 3–7; 9–10 large, about equal in length, symmetrical, forming densely pubescent, compact club (Figs. 7, 10).

Pronotum width 0.7, length 0.8; with a pair of weak depressions; basal margin arcuate; surface with irregular, shallow punctures (Fig. 8). Mesosternum irregularly punctured (Fig. 14), anterior two-thirds horizontal, posterior third strongly reflexed. Metendosternite with a narrow base, broad apically, anterior tendons moderately separated, furcal arms with enlarged and complex apices, lateral lobe of ventral flange long and narrow with reflexed apex (Fig. 16). Wings with jugal lobe, media cubitus, medio-cubital crossvein, costa, radius, 1 well-developed and 2 weakly developed anal veins and an anal cell (Fig. 17).

Elytra width 1.1, length 1.4; with weak subhumeral depression and weakly produced humeral calli (Fig. 20); epipleuron narrow and complete to about basal margin of sternite 4; surface with punctures darkened, decreasing gradually in size posteriorly; strial interspaces convex (Fig. 20).

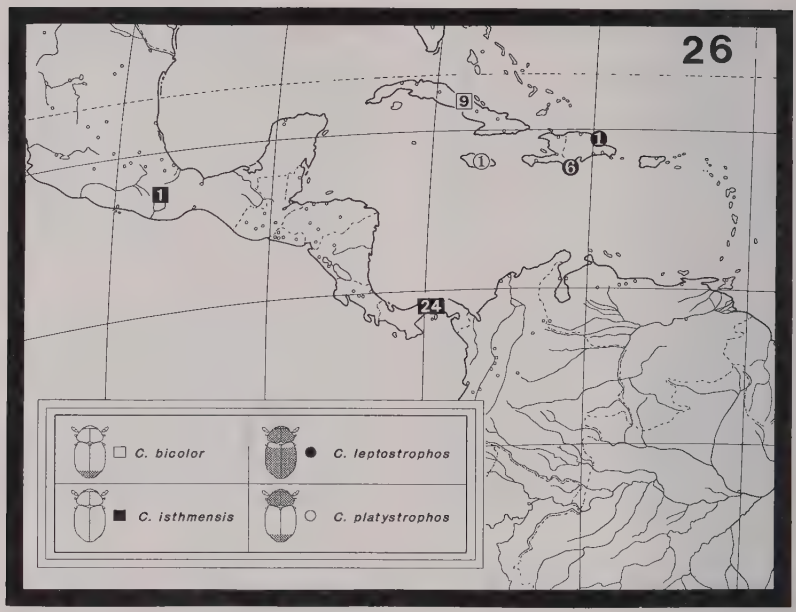


Fig. 26. Distribution of *Carinisphindus* spp.

Abdomen with sternite 1 punctured and about twice length of other sternites; punctures in basal rows on 2–5 well developed; intercoxal process with broad base, acute apex, and weakly raised, broad, median ridge.

MALE. Aedeagus with fused parameres (Fig. 22), median lobe concave apically (Fig. 23) housing fused tip of parameres.

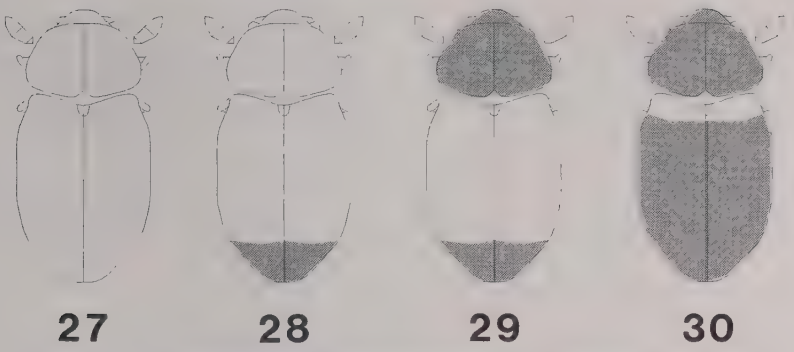
FEMALE. Genitalia with long, preapical stylus (Fig. 24).

TYPE MATERIAL. Holotype: female (USNM) with following label data: "Canal Zone [Panama]:, Barro Colorado, I.Feb., 1976," "J. F. Lawrence, Lot No. 4097," "A. Newton, Collector," "ex Fuligo septica," "GENUS?, Det. J. F. Lawrence." Measurements: TBL 2.2, ELL 1.4, ELW 1.2, PNL 0.6, PNW 0.9, PHW 0.7, CLL 0.2, CLW 0.2. Paratypes: 1 male and 1 female (USNM), 1 male (ANIC) with same label data as holotype. 5 males and 2 females (ANIC, CUIC, USNM): "CANAL ZONE: Is. Barro Colorado II/19–III/9-75 Lawrence, Erwin J. F. Lawrence Lot 3776 Stemonitis sp." 6 males and 5 females (ANIC, CUIC, FMNH, USNM): CANAL ZONE:Barro Colorado Island II/19–III/9-1975 3776 JF Lawrence *Stemonitis* sp." 2 males and 3 females (ANIC, FMNH): "CANAL ZONE: Barro Colorado Island Feb. 18, 1976 4097 JFL (A. Newton) *Fuligo* sp.?"

ETYMOLOGY. Latin, meaning "from the isthmus," in reference to the Central American distribution.

NATURAL HISTORY. This species was collected feeding on *Fuligo septica* and *Stemonitis fusca.*

DISTRIBUTION. In addition to the type locality in Panama, I have seen a single male specimen (ANIC) from Oaxaca, Mexico (Fig. 26), that I am tentatively assigning to this species. It is larger and darker than the type specimens



Figs. 27–30. Color patterns in *Carinisphindus* spp. 27, *C. isthmensis*. 28, *C. bicolor*. 29, *C. platysphinctos*. 30, *C. leptosphinctos*.

and has more convex strial interspaces. It has the following label data: "MEX., Oax., 15 mi. S. Valle Nacional, 4,000' 21.V.1971 S.Peck Ber. 204, leaf litter."

Discussion

Little is known about the biology of this group. All other species in the family Sphindidae are apparently myxomycophagus (Lawrence and Newton 1980; Lawrence 1989; McHugh, in press). It is not surprising therefore, that *C. bicolor* was collected on "a myxomycete on sugarcane" and that *C. isthmensis* was collected on *Fuligo* sp. and *Stemonitis* sp.

A natural dichotomous key, cladistic analysis, classification scheme, and discussion of biogeography are provided by McHugh (in press) for the genera of Sphindidae including *Carinisphindus*.

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The carbon-dust habitus illustration (Fig. 1) was composed by Frances Fawcett (Ithaca, NY). I thank Kent Loeffler (Cornell University) for his skilled photography and Dr. A. Wachtel (University of Connecticut) for assistance with scanning electron microscopy. I thank P. A. Goloboff for assistance with the Spanish translation and Drs. R. P. Korf and W. J. Dress (all Cornell University) for nomenclatural advice.

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NOTES ON TAXONOMY, ECOLOGY AND DISTRIBUTION FOR SOME SPECIES OF *CHRYSOBOTHRIS* ESCHSCHOLTZ (COLEOPTERA: BUPRESTIDAE) OCCURRING IN THE UNITED STATES (INCLUDING HAWAII) AND CANADA

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Abstract

Data are provided under 34 species in the genus *Chrysobothris* Eschscholtz; about one-third of these are treated in detail. The following new synonymy is proposed: *Chrysobothris beeri* Barr = *C. caurina* Horn; *C. blanchardi* Horn = *C. rotundicollis* Gory and Laporte; *C. burkei* Chamberlin = *C. semisculpta* LeConte; *C. columbiana* Barr = *C. rotundicollis*; *C. grandis* Chamberlin = *C. monticola* Fall; *C. lata* Kerremans = *C. cribraria* Mannerheim. *Chrysobothris sinaloae* Van Dyke is treated as a subspecies of *C. peninsularis* Schaeffer. New state/provincial records are given for 22 species, and new larval host records are provided for four species.

In his revision Fisher (1942) treated 115 species (seven newly described) of *Chrysobothris* which were known to occur in the United States and Canada. Subsequent work, including this paper, brings the total number of recognized species to 129, including five that are considered polytypic. My continuing study of this genus over the past 16 years has revealed considerable new information, and much of this is presented here to be available for inclusion in the U.S. Department of Agriculture Catalog, for which the fascicle on Buprestidae is in preparation. Several of the species, such as *C. convexa* Fall, *C. orono* Frost and *C. vulcanica* LeConte, were poorly known thus they are treated here in detail. Similarly, special attention is devoted to some of the synonymies, especially under *C. acutipennis* Chevrolat, *C. pseudacutipennis* Obenberger and *C. monticola* Fall.

New state or provincial records and those confirmed (by rearing) larval host records are so indicated by those categories appearing in CAPITAL letters, or they are otherwise clearly identified. Plant species from which adults have been collected are provided as new records, for reference, or incidentally as part of label data, and may obviously signify a larval association. These plants do not appear in capital letters. In citing data on type specimens, labels are separated by a slash (/) and (h) means handwritten. Codens given at the end of label data and elsewhere indicate collections in which the specimens are deposited, or from which loans were made, and follow Arnett and Samuelson (1986). The species are treated alphabetically.

Chrysobothris acutipennis Chevrolat
(Fig. 1)

Chrysobothris acutipennis Chevrolat 1835. Coleopt. du Mexique, fasc. 8, no. 190; Horn 1886, Trans. Am. ent. Soc. 13:107–108, 120, figs. 188–192 (part) (syn. *acuminata* LeC.); Waterhouse 1887, Biol. Cent.-Amer., In-

secta, Coleopt. 3(1):42–43, pl. 3, fig. 14 (part); *ibid.* 1889:184; Fisher 1942, U.S. Dep. Agric. Misc. Publ. 470:203–205, figs. 85, 123F; Vogt 1949, Ann. ent. Soc. Am. 42:197; Cazier 1951, Am. Mus. Novit. 1526: 46–47; Dominguez-Rubio 1969, Boln. tec. Inst. nac. Invest. for. Mex. 30:9, 12, figs. 3, 4.

Chrysobothris acuminata LeConte 1860, Trans. Am. phil. Soc. (N.S.) (1859) 11:237; Fisher 1942, *ibid.*, 201–203 (part; as valid sp.). **New synonymy.**

The above synonymy represents only references (some differing from former citations as a result of my conclusions) pertinent to the confusion that has existed with regards the named taxa, plus those appearing after Fisher's (1942) revision. This confusion became especially apparent in reading Fisher's revision and examining type material, and largely resulted from a mix-up by him.

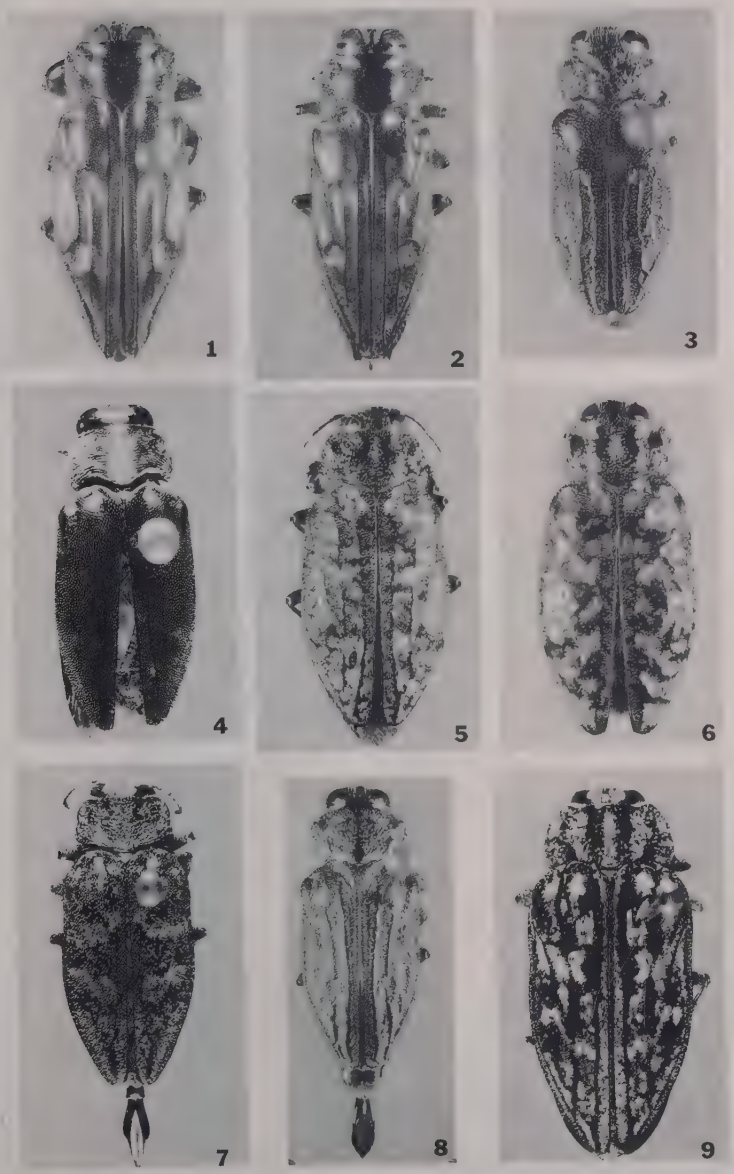
Material I borrowed from the LeConte Collection (MCZC) contained 4 specimens under *C. acuminata* and *C. acutipennis* from the same tray (A. F. Newton, per. comm.), labeled as follows: 1) "C. acuminata Lec./Berland." (h)/ "M.C.Z. Type 3762" (red tag)/"C. acutipennis Chev." (h)/"*C. acuminata* LeC. Fisher '39" (printed in pencil on yellow paper); 2) "78" (h)/"acutipennis 2" (h); 3) "Tex."/"Reisig" (h)/"acutipennis 3" (h)/"C. acutipennis Chevr. Fisher '39" (pencil, yellow paper); 4) "Tex."/"acutipennis 4" (h). These represent two species (1 & 2, length 14.3 and 10.5 mm, respectively; 3 & 4, 18.3 and 19.0 mm) and it is clear that Fisher recognized this. However, he mentioned only specimen 1—validating it as the lectotype of *C. acuminata*—and 2, stating that "without any doubt" they are the specimens mentioned in LeConte's description. There is no direct reference to specimens 3 or 4 in either LeConte's or Fisher's works. However, the latter's description of the male lectotype of *C. acuminata* distinctly fits specimens 3 and 4 (both female!) except the secondary sexual characteristics of specimen 1 (a male) are incorporated! His description of the female best fits specimen 2.

Although Fisher's intentions are clear (*i.e.,* he correctly recognized two species), his results are not; his determination labels on specimens 1 and 3 reflect the opposite. The small size of specimen 2 lends further confusion, as he gave the minimum length of 15 mm in his treatment under *C. acuminata.* Even more confounding is his giving 19 mm as the length of the lectotype.

One might at this point wonder if labels became mixed on specimens. I do not think so, and despite all the confusion specimen 1 (M.C.Z. Type 3762) should be considered the lectotype of *C. acuminata.* I have placed a clarifying label on it. Furthermore, it and specimen 2 match LeConte's original description, in which the phrases "*plagis elevatis sublaevibus nitidus*" and (especially) "*apice singulatim acuminatis et spinula brevi armatis*" regarding the elytra, appear definitely to exclude specimens 3 and 4. However, LeConte gave a length range of 11.2–17 mm, the larger measurement providing the only clue that he might have had two species in his series. Specimens 3 and 4 may have been added to his collection after his description of *C. acuminata* was written.

In addition to examining numerous specimens, I have compared a color slide of the holotype of *C. acutipennis* with the lectotype of *C. acuminata* (which is almost a perfect match for Fisher's redescription of the former!), and there is no doubt that the two are conspecific. Specimens 3 and 4 are *C. pseudacutipennis* Obenberger (*q. v.*). Waterhouse's (1887) illustration of *C. acutipennis* is correctly associated.

Some descriptive clarification is necessary as a result of Fisher's error, otherwise his descriptions can be used; however, the reader must be aware that



Figs. 1–9. *Chrysobothris* spp. 1, *acutipennis,* Cameron Co., Texas. 2, *pseudacutipennis,* Starr Co., Texas. 3, *culbersoniana,* Big Bend National Park, Texas. 4, *indica,* Oahu, Hawaii. 5, *orono,* Pickens, South Carolina. 6, *hubbardi,* Paisley, Florida. 7, *vulcanica,* Wallowa Co., Oregon. 8, *convexa,* Big Bend National Park, Texas. 9, *woodgatei,* N. Rim Grand Canyon, Arizona.

there is much descriptive overlap between the two species now involved, *C. acutipennis* and *C. pseudacutipennis* (= *acuminata, sensu* Fisher). In *C. pseudacutipennis* the front of the head of the male is black and variably cupreous and/or aeneous, with a narrow green margin along each eye, and the vestiture is dense and conspicuous; the clypeus is bright cupreous. In the female the front of the head is mostly black, with faint cupreoaeneous reflections, narrowly green and more broadly cupreous along the eyes; the surface is very coarsely, irregularly, somewhat rugosely punctured, not evidently granulose, and the vestiture is considerably less dense. In both sexes of *C. acutipennis* and *C. pseudacutipennis,* the first four visible abdominal sternites, especially the first, are more appropriately considered shallowly concave at middle. In *C. pseudacutipennis* the serrate submarginal ridge of the last visible ventrite is better developed, especially on the female.

It is interesting to compare average sizes between populations of *C. acutipennis* and *C. pseudacutipennis* from SE Texas/northern Mexico and the Yucatan peninsula, from which regions came all but a few of the specimens studied. Males of *C. acutipennis* from the north range in length from 11.1–15.3 mm (n = 9, $\bar{x}$ = 13.3 mm), females from 10.4–15.0 mm (n = 15, $\bar{x}$ = 13.2 mm); from Yucatan the males range from 10.6–16.1 mm (n = 24, $\bar{x}$ = 13.9 mm), females from 11.7–16.2 mm (n = 18, $\bar{x}$ = 13.8 mm). Males of *C. pseudacutipennis* from the north are 14.1–17.4 mm (n = 14, $\bar{x}$ = 16.2 mm), females are 15.7–19.7 mm (n = 6, $\bar{x}$ = 17.7 mm); from Yucatan males are 11.8–13.6 mm (n = 3), females are 11.6–16.2 mm (n = 11, $\bar{x}$ = 13.5 mm). From these data it is clear that *C. pseudacutipennis* averages larger in size than *C. acutipennis* in northern regions; also, it differs by having a distinct dark greenish luster. Less certain is that specimens of *C. pseudacutipennis* average considerably smaller in the south. In *C. acutipennis* there seems to be tendency for larger specimens in southern regions, as 48% of the specimens were above average versus 37% for northern specimens; additionally, eight specimens from Central America average 15.9 mm.

While body color and average size may be good distinguishing characters in the northern part of the range of these species, overall they are more readily separated by the anterior femoral tooth, which is obtusely rounded in *C. acutipennis* and acutely triangular in *C. pseudacutipennis*; and in the male by the outer segments of the antennae, which are uniformly metallic reddish above (testaceous and greenish-black below) in *C. acutipennis,* while in *C. pseudacutipennis* they are uniformly testaceous tipped with black.

The distributional range for *C. acutipennis* is from SE Texas to northern South America. It has been recorded in the literature from Arizona, but this is based on a misidentification (see under *C. pseudacutipennis*). Records from Mexico outside the eastern coastal states should be verified and may refer instead to *C. merkelii* Horn. Much more collecting in Mexico is necessary in order to more accurately define the species limits of this group. I have seen specimens from Mexico, TABASCO, Cardenas, 30-VI-83; Teapa, 10-IV-79, CEAM. The only confirmed host recorded is *Pithecellobium flexicaule* (Bentham) Coulter (in Texas); another host is *LEUCAENA PULVERULENTA* (Schlectendal) Bentham, Texas Hidalgo Co., Delta Lake Co. Park, 27/28-III-86, GHNC.

***Chrysobothris adelpha* Gemminger and Harold 1869:1423.** OKLAHOMA, McCurtain Co., Idabell, 9-VI-79, W. C. Shepard Coll.

***Chrysobothris arizonica* Chamberlin 1938:13.** NEW MEXICO, San Juan Co., Navajo Lake, 25-V-74, BKDC. Adults of this species are commonly col-

lected from juniper; however, the only larval host known has been *Haplopappus laricifolius* Gray (Hetz and Werner 1979). I have seen a specimen reared from *GUTIERREZIA SAROTHRAE* (Pursh) Britt. & Rusby, Arizona, Pima Co., Three Points, 29-I-76, UAIC.

***Chrysobothris azurea* LeConte 1857:8.** ALBERTA, 7 mi S Empress, em. 5-III/5-VIII-81, ex *PRUNUS VIRGINIANA* L. wood coll. VII-80, G. Hilchie, RLWE. KANSAS, Crawford Co., 26-V-87, on dead *Cercis canadensis,* T. C. MacRae Coll.

***Chrysobothris biramosa biramosa* (Fisher) 1935:117.** NEVADA, Mineral Co., Walker Lake, 22-VII-78, reared ex *Atriplex* sp., UIMC.

***Chrysobothris carinipennis* LeConte 1878:459.** Bright (1987) located this species in SW British Columbia on his distribution map. I have not seen specimens from the Cascade Range or westward, therefore suggest that his SW British Columbia distribution refers to the closely related *C. pseudotsugae* Van Dyke, for which he gave "Frye Creek and Merritt, BC" as "Canadian records." However, Fisher (1942) provided those same two SE British Columbia localities under *C. carinipennis.* Though it is impossible to tell from his book, Bright's records probably are mistakenly applied from Fisher's work, as *C. pseudotsugae* appears to be absent east of the Cascades. The foregoing brings the British Columbia distribution of these species into line with that given by Barr (1971).

Chrysobothris caurina Horn

Chrysobothris caurina Horn 1886, Trans. Am. ent. Soc. 13:92, pl. 4, figs. 105–109 (part); Fisher 1942, U.S. Dep. Agric. Misc. Publ. 470:161–163, figs. 66, 120F (part).

Chrysobothris beeri Barr 1969, Proc. ent. Soc. Wash. 71(2):128, figs. 6, 13. **New synonymy.**

Chrysobothris laracis [sic!]: Chamberlin 1932, J. econ. Ent. 25:834. Misidentification.

Even though it is not an uncommon beetle, *C. caurina* has an obscure taxonomic history because it was long confused with a much more widespread and abundant species. Barr (1974) recognized and clarified this confusion when he described *C. leechi.* With the exception in part of Horn (1886) and Fisher (1942), all other references to *C. caurina* refer almost entirely to *C. leechi.*

In contrast, all references to *C. laricis* Van Dyke (*q. v.*) occurring in California must be considered pertaining to *C. caurina,* although these apparently allopatric species are very closely related. Notable was a characterization of specimens from Yosemite National Park by Van Dyke (1918). I have examined many specimens from this area of the Sierra Nevada northward through Washington, comparing them to type material of *C. beeri* and an excellent photographic slide (courtesy of W. F. Barr) of the holotype of *C. caurina.* I find these species to be conspecific. Based on the foregoing discussion and considerable study of this species group of *Chrysobothris,* especially in the western United States, the distribution of *C. caurina* should be restricted to the Pacific Coast states, Nevada and British Columbia, probably not occurring east of the Sierra Nevada and Cascade Range.

***Chrysobothris chiricahuae* Knull 1937:37.** Fisher (1942) keyed this species to two places, since with it and some others (*e.g., C. semisculpta* LeConte) there are some problems interpreting couplet 24. I have examined nine specimens and in my opinion *C. chiricahuae* more closely matches Fisher's second alternative. Taking this route leads to the discovery that he misplaced *C. chiricahuae*

into couplet 98. In couplet 96 he clearly directs the user to couplet 102 (one may wonder if he intended the phrase concerning *C. chiricahuae* to appear in the first alternative). However, in this species the base of each elytron is not angulate at middle; instead it is very broadly rounded, though sometimes slightly sinuate at the middle (a character not mentioned in the original description or by Fisher). Given this, *C. chiricahuae* keys into couplet 104, where it can be readily distinguished by its relatively smooth, indistinctly and narrowly sulcate pronotum, and in the male the protibia is obtusely dentate at its apical third rather than apically dilated. The relationship of it to any species in the United States fauna is not readily apparent, though superficially it most closely resembles *C. semisculpta.* I feel that its affinities lie with the Mexican *C. densa* Waterhouse.

The male protibial tooth would appear to exhibit considerable variation, since it may be more narrowly rounded than on the holotype or may be broadly truncate; in the five specimens examined it is well developed. The mesotibial tooth is much smaller and very obtusely angular.

According to G. H. Nelson (in litt.), he collected 100 specimens during 1984, mostly from the underside of small pine limbs that were near or on the ground; some of the limbs were placed that way on purpose. I have observed this habit in several species of the genus. All specimens were collected high in the Chiricahua Mountains, Arizona, which is the only locality known for this beetle. The specimens ranged in length from 8.7–12.0 mm.

Chrysobothris convexa Fall
(Fig. 8)

Chrysobothris convexa Fall 1907, *in:* Fall and Cockerell, Trans. Am. ent. Soc. 33:180, 233–234; Fisher 1942, U.S. Dep. Agric. Misc. Publ. 470:231–232, figs. 99, 126A.

When Fisher (1942) revised the genus *Chrysobothris* he saw only two specimens of *C. convexa,* the female holotype from New Mexico and a male from SW Texas; therefore, scarcely any discussion of variation could be given. Also, several important characters were either overlooked or inadequately defined. In addition to those specimens above, I have examined 7 male and 11 female specimens from Texas: Brewster Co., Big Bend N.P., Chisos Mts.; 6 mi E Panther Jct.; Pine Can. trailhead, 29°16′N, 103°14′W, 4,700′; Lost Mine Trail, 29°16′N, 103°15′W, 6,000–6,850′, 29/VI–11/VII, FMNH, RLWE. Presidio Co., 12 mi N Presidio, 6-V, USNM. Val Verde Co., 24-25 mi E Dryden, 22-VI/1-VII, GHNC. All but one were labeled as collected from *Viguiera stenoloba,* a shrubby composite. Since this beetle is so unusual and little known, and is misplaced in Fisher's key, information is presented below to point out some important and variable taxonomic characters, to facilitate its identification and to help establish its relationship with others in our fauna.

Two major taxonomic characters, heretofore overlooked, together serve to distinguish *C. convexa* from all other known species of *Chrysobothris* from the United States. First, the clypeus is strongly elevated basally, forming a transverse carina on each side which extends from the lateral angles one-half to two-thirds the distance to the midline, thus giving the clypeus a deflexed appearance. The carinae usually are well developed and sharply defined, but may be narrowly interrupted. I found this distinctive clypeal configuration to be approached elsewhere in the genus only by several atypical specimens in the

group comprising *C. texana* LeConte and its relatives, none of which are even remotely allied to *C. convexa.*

The second character is of primary importance in using Fisher's key and concerns the presence of elytral vestiture. Fisher described the elytra as glabrous; in fact, they bear very sparse, short, usually extremely inconspicuous setae which are placed mostly adjacent to the costae. These setae are longer basally and are more numerous in the humeral region; they are similar to those of *C. beyeri* Schaeffer, though in that species the setae are longer and more conspicuous and abundant. Extreme care must be taken to observe the elytral vestiture, especially on specimens that may have been rubbed, become greasy, or come in contact with fluids.

Chrysobothris convexa exhibits a quite uniform facies. The most obvious variation is in size, the length ranging from 9.6–13.6 mm ($\bar{x}$ = 11.9 mm). The head, in addition to the well-developed chevron of the vertex, bears variably developed frontal callosities ranging from one very small, irregular callosity on either side of the middle to a distinct and well-defined cordate elevation. In all but two specimens, the callosities touch at some point with the chevron. In all specimens the occipital carina, which varies in width, is strong and even, bears a fine longitudinal groove, and merges with the chevron. The front margin of the clypeus ranges from shallowly notched to broadly, shallowly, angularly emarginate at middle, and the sides may be slightly sinuate. Unfortunately the type specimen is atypical in this respect, which caused undue emphasis to be placed on the clypeal margin as a unique character. Nevertheless, the overall aspect of the clypeus certainly is distinctive.

The configuration of the pronotal surface is quite distinctive in this species, though the callosities are variably developed and the four transversely arranged ones may be poorly defined or connected on one or both sides. The smooth median line is usually very well defined but may be uneven and sharply constricted or confused by punctures; it is variable in width and extends from the base of the pronotum to or just behind the front margin.

The elytral costae exhibit slight variation, mostly in the nature of their apical termination and coalescence. The first, second and usually the fourth ones are elevated posteriorly. On all but one specimen there are irregularly elongate, shining black smooth areas between the costae, randomly located and sometimes vaguely indicated.

Both Fall (1907) and Fisher (1942) described the prosternum as without a median lobe; however, of the 20 specimens examined, 12 (including the type) bear a feeble, sometimes only partially developed lobe.

Fall described the last visible abdominal sternite as without serrate margins. Fisher described the margins "not distinctly serrate" (type), but found them "slightly serrate" on the other specimen available to him. However, he retained *C. convexa* for those species having entire margins, stating that more material might prove this relationship incorrect. The type actually has the margins feebly crenulate, with a vague tooth on one side. The remainder of the specimens I examined exhibit considerable variation (even between sides on the same individual), ranging from irregularly and indistinctly serrate-crenulate to finely, distinctly, rather uniformly serrate. The lateral callosities of the abdominal sternites are vague or absent on some segments, particularly on the last and penultimate ones.

In addition to the characters given by Fisher for differentiating the male, the prosternum is coarsely, rather confluently punctate and bears much longer and more densely placed white setae. The median portion of the metasternum

and coxal plates and, to a lesser degree, the venter are more densely punctate and clothed with setae which are more densely placed and somewhat longer than in the female. One of the males examined has the front of the head a lighter coppery brown, and the clypeus is largely green.

In Fisher's key, *C. convexa* is misplaced. It should run to couplet 11, but fits neither alternative therein, though its distinctive clypeal configuration and short, sparse, inconspicuous elytral setae will readily distinguish it. It shares the most characters with the *subcylindrica*-group, species which are in a state of evolutionary flux; they are poorly defined and in great need of biosystematic endeavor. However, *C. convexa* would stand alone in this group. Collecting data presented here strongly suggest *V. stenoloba* is a host for this beetle, strengthening its ties to the *subcylindrica*-group which contains the only species known to me in North America that are associated with Compositae.

***Chrysobothris crandalli* Knull 1943:34.** NEVADA, Churchill Co., 7 mi W Fallon, 18-VI-88; Lincoln Co., 3 mi N Lyman Crossing, T9S, R67E, Sec. 2 and Hoya, T11S, R66E, Sec. 30, 14-VI-88, all collected on *Heliotropium curassavicum,* NVDA, RLWE. UTAH, Emery Co., 3.2 air mi NE Little Gilson Butte, 5,000', 3-VI-82, EMUS. There are no published records of host data for this species. In California, adults have been collected on *Franseria acanthicarpa* and *Hymenoclea* sp. in San Bernadino Co. and on *Chaenactis* sp. in Riverside Co. Specimens of what appears to be a more brightly colored variety of *C. crandalli* were taken on flowers of *Encelia virginensis actoni* in Inyo Co., Owens Valley. According to C. L. Bellamy (in litt.) he and others have collected it on lower stems and exposed root crowns of *Palafoxia linearis* and on lower stems of dead *Croton wigginsi* in Imperial Co., Algodones Sand Dunes. The foregoing plants are all in the family Asteraceae except for *H. curassavicum* (Boraginaceae) and *C. wigginsi* (Euphorbiaceae). Most of the collections with which I am familiar were made in sandy habitats, and this may be more of a limiting factor in the distribution of *C. crandalli* than is the host plant.

Chrysobothris cribraria Mannerheim

Chrysobothris cribraria Mannerheim 1837, Soc. imp. nat. Moscou Bull. 10(8):77.

Chrysobothris floricola Gory 1841, Hist. Nat. icon. insectes Coleopt., suppl., p. 179 (synonymy by Nelson 1980).

Chrysobothris lata Kerremans 1899, Ann. Soc. ent. Belg., 43:336. **New synonymy.**

Chrysobothris lata is known only by the type (BMNH), which bears the locality "Floride" and measures 13.2 mm by 5.6 mm. Barr and Westcott (1976) related it to *C. rotundicollis* Gory and Laporte (*q. v.*), but its resemblance to that species is superficial. It matches well with large Florida specimens of the common, widespread and variable *C. cribraria.*

***Chrysobothris culbersoniana* Knull 1942:34.** This species (Fig. 3) was described and has been known from only two males with scanty locality data. The holotype (FMNH) is labeled "Culberson Co., Tex., V-10-41/D. J. & J. N. Knull Collrs./HOLOTYPE" (printed) "Chrysobothris culbersoniana Knull" (red card)/"J. N. Knull Collection/Chrysobothris culbersoniana KNULL, det. J. Knull." I have compared it to a female (8.1 mm) from Texas, Brewster Co., Big Bend N. P., Chisos Basin, 9-V-80, beating *Quercus* sp., RLWE, and found them conspecific. I have also examined a female (8.6 mm) and male (7.2 mm)

from NEW MEXICO, Hidalgo Co., Hwy. 80: 8 mi S Road Forks, 13-VI-82 and 8 mi S Roadsend [*sic*!] (probably = Road Forks), 17-V-83, both on *Acacia greggii,* F. M. Beer Coll., UIMC. G. H. Nelson (in litt.) provided an additional record from nearby: Granite Gap, 13-VI-83, on *Acacia constricta,* GHNC. Females differ as follows: Last visible abdominal sternite less flattened, broadly and weakly bisinuate at apex (Fig. 13); eighth tergite thickened apically, broadly rounded, densely, coarsely and deeply punctate (not described by Knull; in the male, thickened and bimarginate apically, dorsal margin subtruncate with slight narrow emargination at middle, ventral margin broadly rounded, less densely and not deeply punctate); anterior tibia practically straight, unarmed.

This species appears closest to *C. subcylindrica* Menetries and its allies, but unlike most of them its limits appear well defined. In fact, it does not appear closely related to any species known to me. The indistinct (except at very base and apex) elytral vestiture; lack of lobe on anterior margins of prosternum; and in the male, cupreous-black front of head (in almost every example of the *subcylindrica*-group known to me this is bright green) and genitalia are very distinctive.

***Chrysobothris exesa* LeConte 1858:68.** California, Imperial Co., Laguna Dam, 6/22-V-79, reared ex. SALIX sp., CJSC. Known hosts were mesquite and acacia.

***Chrysobothris idahoensis* Barr 1969:124.** NEVADA, Elko Co., Ruby Mts., Island Lake, 9,500′, 22-VII-76, EMUS.

***Chrysobothris indica* Gory and Laporte 1837:12.** Students of the Buprestidae apparently have been unaware that this species (Fig. 4), reported as widespread from India to Indonesia, has been introduced in Hawaii. It was called to my attention by B. Kumashiro (in litt.) who provided the following information from various volumes of the Proc. Hawaiian Ent. Soc. [all taken from the section on Notes and Exhibitions (anonymous)] and based on specimens collected in Honolulu. It was first collected in 1946, then again in 1947, being reported as "*Chrysobothris* sp." [13:12 (1947), 13:208 (1948), 13:323 (1949)]. In 1948 it was identified as "*C.* near *tristis* Deyrolle" by W. S. Fisher [13:341 (1949)], and in 1953 [15:275 (1954)] it was reported that a specimen "bit a boy on the lip" (a behavior one might expect from a species of *Oxpteris* instead!). Distributional and host data (outside Hawaii) and identification as *C. indica* were given in 16:19 (1954) and 23:324 (1981). Most of these specimens are in HDOA.

Specimens kindly given to me by Mr. Kumashiro were confirmed as *C. indica* by S. Bily (NMPC) and were collected at Salt Lake [district of Honolulu], 10-V-71 and Mililani [Town], 30-X-85, the latter being the only Oahu record from outside of Honolulu. However, Mr. Kumashiro (in litt.) reported a specimen from Maui, Kahului, 1-XI-85, ex light trap at airport, HDOA. There is a specimen from Hickam Field, Oahu, VI-59, in the USNM (J. M. Kingsolver, in litt.).

***Chrysobothris laricis* Van Dyke 1916:409.** COLORADO, Gunnison Co., near Gothic, Virginia Basin, 11,000′, 19-VII-80, W. B. Warner Coll.; Jackson Co., Gould, 12-VIII-70, *Pinus contorta,* SGWC, RLWE; Larimer Co., Rocky Mt. N. P., Milner Pass, 10,750′, 6-VIII-72, Englemann spruce, RLWE. Literature records of this species from California are in error and should refer to *C. caurina* (*q. v.*); Chamberlin's (1932) record from "Oak Ridge," Oregon, also can be referred to that species, as I have seen *C. laricis* only from the northeastern part of this state and *C. caurina* is widespread in the Cascade Range. Barr and Westcott (1976) provided the only record of *C. laricis* from Arizona

(Greer, 8,000'): Others are Coconino Co., Jacob Lake, 28-VII-76; Graham Co., Pinaleno Mts., 9,000', 21-VI-80, *Pinus* and *Abies* slash, both BKDC & RLWE. The latter represent the southernmost known occurrence of this predominantly Rocky Mountains species. Van Dyke (1916) recorded the type locality as "Grant County, Oregon," but Chamberlin (1926) cited "Sumpter" (which is in Grant Co.). It can safely be assumed that the type locality is Sumpter, since Chamberlin collected the specimens (Van Dyke 1916:410).

***Chrysobothris leechi* Barr 1974:3.** No specific locality data exist for this species in Nevada, though its occurrence in the far western mountainous regions of that state has been taken for granted: Douglas Co., 3 mi E Stateline, 25-VI-68, RLWE.

***Chrysobothris lineatipennis* Van Dyke 1916:411.** Originally described as a subspecies of *C. mali* Horn, it was later accorded species rank (Van Dyke 1923). The two are very close and belong to a group where species limits are at best difficult to define. The widespread *C. mali* is highly variable and utilizes a multitude of hosts. In contrast, *C. lineatipennis* occupies a much more restricted range within that of *C. mali,* is not nearly so variable, and seems restricted to plants in the genus *Eriogonum.*

Ironically, I found all but one of the distinguishing characters given by Van Dyke (1916) to be variable and of little use in differentiating the two taxa. However, he had very few specimens of *C. lineatipennis* for study. Fisher (1942) saw only a female, from which he made his redescription, and provided no original discussion. The holotype is a male; however, since Van Dyke's description was only to separate subspecies he did not provide sexual differences. These are, however, the same as found in *C. mali.* In males of both species the face varies in color from bright to rather dull green, occasionally with strong coppery overtones, and the prosternum is rather densely (rather than sparsely, as described by Fisher for *C. mali*) clothed with long setae, as opposed to sparsely so in the female.

I compared 39 specimens of *C. lineatipennis* to 115 of *C. mali* (most collected from southern California to southern Oregon) and found the elytral foveae to provide the best means for separation. In the former, on each elytron there is a single antemedian fovea which nearly or (usually) entirely interrupts the second costa, and there is only one small posterior fovea, which usually is indistinct or absent; when present it may be located at about the apical 3/8, which usually is near the end of the third costa. In *C. mali* there almost always are three foveae, the posterior ones usually being distinct and sometimes coalesced. Additionally, in *C. lineatipennis* the elytral costae usually are more extensively and strongly elevated, and the margins of the elytra usually are more finely serrate apically; however, the latter character is much less useful. The males may be distinguished by their genitalia (Fig. 12). In female *C. mali* the last visible sternite usually is more deeply notched, yet this is a variable character in both species. Finally, *C. lineatipennis* has always been collected from plants in the genus *Eriogonum,* while *C. mali* rarely occurs on that plant.

Chrysobothris monticola Fall

Chrysobothris monticola Fall 1910, Jl. N.Y. ent. Soc. 18:51–52, fig. 1g; Fisher 1942, U.S. Dep. Agric. Misc. Publ. 470:158–160, figs. 65, 120E.

Chrysobothris grandis Chamberlin 1938, Pan-Pacif. Ent. 14:14–16, figs. 17–19; Fisher 1942, *ibid.,* 155–156, fig. 63; Barr 1971, *in:* Hatch, Beetles Pacific Northwest 5:79, 81. **New synonymy.**

This species is one of the most widely ranging western representatives of a related group (part of Group IV of Horn 1886) which utilize the coniferous family Pinaceae as hosts. It was described from southern California and ranges from northern Baja California (Sierra Juarez, .6 & 4.5 mi S El Condor, 6/7-VII-75, RLWE; Sierra San Pedro Martir, Rcho. Viejo Mdw., 14-VI-54, CASC. **First records for Mexico**) to British Columbia, eastward across northern and central Idaho to western Alberta and MONTANA (Ravalli Co., Sula, 10-VII-22, FMNH), then south to central Colorado. Judging from the paucity of specimens seen, it is uncommon east of the Cascade Range and Sierra Nevada. It has a large elevational amplitude, specimens having been collected from about 200 m to 3,660 m above sea level; however, they are not often encountered in numbers above 1,525 m, except in southern California. This beetle has been recorded from four species of pines; additionally, I have collected it on *Pinus sabiniana* Dougl. and a species of pinyon. Probably it will utilize any species of pine growing within its range.

As might be expected of a species with such an extensive range, *C. monticola* exhibits considerable variation. I have examined approximately 400 specimens. The arrangement of the raised black sculpturing and the color of the depressed punctured areas of the dorsal surface are particularly variable. The color of the venter ranges from bright coppery to purplish black, often with brassy-green reflections. The clypeal emargination varies in width and depth. The specimens examined ranged from 10.2–16.5 mm in length. In females the apical emargination of the last visible sternite varies from narrowly to broadly triangular, shallow or deep; however, on some specimens the median ventral margin, which is continuous with the submarginal ridge of the sternite, is arcuate. Fisher's (1942) key and figure (65D) are misleading at best; his figure (63B) for *C. grandis* very well represents *C. monticola*. Additional variation was provided by Fisher.

The male genitalia (Figs. 10, 11) are distinctive for this species, though the degree of expansion and abrupt constriction of the parameres is slightly variable, and the apex of the median lobe varies from narrowly rounded to subtruncate (the usual condition is broadly rounded). These variations may occur within a single population. A distinctive feature not mentioned by previous writers is the color pattern of contrasting testaceous or reddish-testaceous and dark brown or (usually) black. This pattern is quite uniform in 64 specimens examined from Idaho and the Pacific Coast states; however, in three of four specimens examined from the Rocky Mountain region, the internal piece of the median lobe was only slightly infuscated.

The differing facies of specimens from the latter area is at once evident, yet difficult to assess. It has been quite adequately described by Fisher. I have examined 17 specimens from this region, including most of those seen by Fisher. The most distinctive feature is the more diffuse sculpture of the elytra. Secondarily, the median pronotal sulcus is not usually as well defined as in the more western populations, largely an effect of the less elevated and more irregular callosities bordering the sulcus. I have studied seven specimens from Idaho and most appear more related to Rocky Mountain populations, but some seem to represent a transition form. Further collecting in these regions may provide evidence for subspecific distinction. Although Rocky Mountain forms usually can be readily recognized, insufficient material is available to properly assess the nature of what may be just a clinal relationship.

I examined the holotype of *C. grandis* (CASC #5489) and found it conspecific with *C. monticola*. The former was described from one exceptionally large

Figs. 10–13. *Chrysobothris* spp. 10, 11, male genitalia (dorsal and ventral), *monticola,* Josephine Co., Oregon. 12, male genitalia (dorsal), *mali* (left), Jackson Co., Oregon; *lineatipennis* (right), Los Angeles Co., California. 13, apex last visible sternite of female *culbersoniana,* Hidalgo Co., New Mexico.

female collected in east-central Oregon; the phenotypical expressions fall clearly within the range of variability of the western populations of *C. monticola.* I have not seen other specimens from Oregon east of the Cascade Range, though I have collected rather extensively there. Fisher recorded *C. monticola* from that region.

It seems odd that previous writers concerned with *C. grandis* did not even

mention an affinity with *C. monticola*. Chamberlin (1938), in comparing it to *C. californica* LeConte (probably due to similarity in size), stated that ". . . the prominently lobed prosternum [of *grandis*] at once separates it." Fisher (1942) did not discuss the relationship, but took exception to Chamberlin, stating ". . . but the lobe is very narrow, and the species could be easily mistaken for one without a median lobe . . . ." Chamberlin's description of the prosternal lobe is the more accurate. Although this character is not uniformly reliable in some members of this species group, it appears to be extremely reliable in *C. monticola*. Barr (1971) restricted *C. monticola* to southern California and referred to the Pacific Northwest populations as *C. grandis*. *Chrysobothris monticola* appears to be most closely related to *C. leechi* Barr and was compared (as *C. grandis*) to that species by Barr (1974).

***Chrysobothris nixa* Horn 1886:98.** MONTANA, Gallatin Co., 11-V-57, MTEC. This represents the easternmost locality known for this species.

***Chrysobothris octocola* LeConte 1858:67.** When Nelson (1975) reviewed the group to which this species belongs, he was unaware that it had been reported from Hawaii: Oahu [Coop. Econ. Insect Report, USDA, 10:608 (1960); Proc. Hawaiian Ent. Soc. 17:321 (1961)] and Hawaii [CEIR 15:1306 (1965); Proc. Hawaiian Ent. Soc. 19:147 (1966)]. According to B. Kumashiro (in litt.), who provided several collection records from Oahu (1964–1984, HDOA), the species ". . . is found in the drier areas, where there is an abundance of mesquite." Specimens were collected from May through January, most being taken from July through October. Additional records for *C. octocola* are: Hawaii Island, Puako, 29-XII-67, BPBM, and Hapuna Beach, 25-IX-74, RLWE; Lanai Is., Hulopoe Bay, 7-VI-71, BPBM. According to Johnston (1962) the only species of mesquite in Hawaii is *Prosopis pallida* (Willd.) HBK, a South American species, though most likely *C. octocola* was introduced into the islands in mesquite wood from SW United States where it is widespread and common. There are few records from the southern part of its range, in Mexico, except for Baja California. Nelson (1975) did not report it from San Luis Potosi (Chamberlin 1926) or Morelos (Cazier 1951). Since several closely related species occur in Mexico, those records may have been in doubt; however, I have been able to verify them.

Known larval hosts for *C. octocola* are shrubs and trees in the family Fabaceae; however, adults occasionally have been taken on plants in other families. An interesting record was obtained by R. C. Bechtel (in litt.), who collected larvae, pupae and teneral adults from a dooryard peach, PRUNUS PERSICA Batsch (Rosaceae), in Las Vegas, Nevada, 30-III-89, NVDA.

Chrysobothris orono Frost
(Fig. 5)

Chrysobothris orono Frost 1920, Can. Ent. 52:232.
Chrysobothris hubbardi: Nelson *et al.*, 1981, Coleopts Bull. 35:141 (in part, misidentification).

Nelson *et al.* (1981) recorded *C. hubbardi* Fisher for the first time from Georgia and South Carolina based on two specimens identified as that species in the J. N. Knull Collection (FMNH). I have compared them with a color slide of the holotype and a female from Florida, Paisley, 21-IV-76, BKDC, and a series of *C. orono* from South Carolina, Pickens Co., 7 mi NE Pickens, various dates in V and VI/79–86, BKDC, RLWE. Only the specimen from

South Carolina, Jocassee (a female) is *C. hubbardi*. Kirk (1970) listed *C. orono* (det. by J. N. Knull) from Jocassee based on at least two specimens. One of those is the aforementioned *C. hubbardi* specimen; another, a female, was sent to me from CUCC and it too proved to be *C. hubbardi*. Based on the foregoing discussion, *C. orono* in GEORGIA and SOUTH CAROLINA represent new state records, and *C. hubbardi* should be stricken from the Georgia list, even though it probably occurs there.

From *C. hubbardi* (Fig. 6), *C. orono* is distinguished by being more elongate and convex, and on each elytron the first costa is well developed, strongly elevated apically, and the raised smooth areas generally are more diffuse. Also, in *C. orono* a second elytral costa usually is more or less evident, and occasionally a small portion of a third costa. Fisher (1942) utilized the shape of the apical emargination of the last ventrite of the female to separate these species. I found this character in both to fall well within a range of variation to be considered normal for a single species in the genus; however, the sternite itself appears more narrowly triangular in *C. orono*. The strongly cupreous color above in *C. hubbardi* from Florida contrasts with weak cupreous reflections in those from South Carolina. The specimen of *C. orono* from Georgia is strongly cupreous above, while those from South Carolina bear moderate to weak cupreous reflections. The pronotal and elytral callosities are more elevated and distinct on the specimen of *C. hubbardi* from Florida, while in the South Carolina specimens these areas are considerably more punctate and similar to that found in *C. orono*. Despite these similarities *C. hubbardi* appears to be a valid species, though a reliable conclusion awaits discovery of the male.

Males of *C. orono* examined ranged in length from 11.4–16.0 mm ($n = 13$, $\bar{x} = 13.7$); females were 14.4–16.7 mm ($n = 8$, $\bar{x} = 15.5$); the small males will key to *C. trinervia* (Kirby) in Fisher (1942). However, *C. orono* is readily separated: in the males by a much more elongate protibial dilation, lack of a distinct greenish reflection ventrally (though sometimes this is faint in *C. trinervia*), and distinct genitalic differences; and in the female, by the broad, shallow apex of the last visible abdominal sternite (which is notched in *C. trinervia*).

Wilson (1969) discussed the biology of *C. orono* in Michigan, mostly on young (4–10′) red pines. The beetles were noted to attack only living trees, 98% on the bole, 2% near the base of a branch. According to H. L. Dozier (in litt.), he collected the specimens from South Carolina only on exposed roots of large living pines. These roots were always in the sun and with damaged surface—bark removed in places, and at times with resinous areas or oozing sap at edges of the bark. Larval workings were located in heavily resinous areas under the bark on the underside of roots. Adult emergence holes were located on the upper surface, and resinous "push-ups" were often seen on the sides and tops of an infested root.

Chrysobothris peninsularis Schaeffer

Chrysobothris peninsularis Schaeffer 1904, Jl. N.Y. ent. Soc. 12:207.

This species has been recorded from Texas to California and the Baja California peninsula. I consider it to be polytypic, rationale for which is given under the following taxon. Specimens examined from W. Texas, W. Arizona, S. California and Baja California belong to the nominate subspecies, as does the following: NEVADA, Lincoln Co., Elgin, 3,900′, 17-VI-85, RLWE.

Chrysobothris peninsularis sinaloae Van Dyke, new status

Chrysobothris sinaloae Van Dyke, 1951, Pan-Pacif. Ent. 27:30; Dominguez-Rubio, 1969, Boln. tec. Inst. nac. Invest. for. Mex. 30:40 (redesc. in Spanish).

Van Dyke related his species to *C. peninsularis,* but did not utilize male genitalia in the comparison. Based upon this character alone I would find these taxa to be conspecific. Van Dyke distinguished *C. sinaloae* by its larger size, a broader prothorax and, in the male, a green frons (bronzed in *C. peninsularis*) and less developed protibial dilation and tooth. I examined 16 male, 16 female *C. p. peninsularis* and 8 male, 12 female *C. p. sinaloae* (including two paratypes): There appears to be no differences in the prothorax, and the male characters are somewhat variable, though likely useful in separation if a series is available. In length, specimens of *C. p. peninsularis* ranged from 9.1–13.6 mm ($\bar{x}$ = 11.5 mm) and those of *C. p. sinaloae* ranged from 11.4–15.5 mm ($\bar{x}$ = 13.4 mm). Females average slightly larger. Additionally, and perhaps most useful when dealing with few specimens, *C. p. sinaloae* bears strong bronzy reflection dorsally, while this is usually weak in *C. p. peninsularis.* Fisher (1942) gave the length of *C. penisularis* as 11–14 mm and said that specimens from Arizona were "more bronzy brown." Thus, it is possible that those specimens represent *C. p. sinaloae.* In Mexico it has been known from near Mazatlan, Sinaloa, to near Ciudad Obregon, Sonora. I have examined specimens from CHIHUAHUA, Sa. Madre [Occid.], La Bufa, 3,000′, 8-VII-72, RLWE; COLIMA, Armeria, 10-VIII-62, CEAM; JALISCO, 17 km SW La Huerta, hwy. 80, Km 235, 370 m, 9-X-88, RLWE; MICHOACAN, 7 km N La Placita, 18°35′N, 103°36′W, 11-X-88, RLWE.

Van Dyke mentioned the superficial resemblance to *C. distincta* Gory and *C. schaefferi* Obenberger, and indeed *C. peninsularis* appears related to them. It bears no similarity to *C. densa* Waterhouse, *C. pusilla* Gory and Laporte, or *C. neopusilla* Fisher, as alluded to by Dominguez-Rubio.

***Chrysobothris piuta* Wickham 1903:67.** MONTANA, Madison Co., Gravely Mts., 29-VII-84, CLBC. This represents the northernmost locality for this species, the nearest being Reno, Nevada. Another interesting collection is California, Shasta Co., vic. Whiskeytown L., road to Mad Mule Mt., 2,300′, 4-VII-82, RLWE.

Chrysobothris pseudacutipennis Obenberger
(Fig. 2)

Chrysobothris acutipennis: Horn 1886, Trans. Am. ent. Soc. 13:104, 107–108 (part), pl. 6, figs. 188–192; Knull 1937, Entomol. News 48:38.

Chrysobothris pseudacutipennis Obenberger 1940, Sbor. entom. odd. Nar. Mus. v Praze 18(181):94–96.

Chrysobothris acuminata: Fisher 1942. U.S. Dep. Agric. Misc. Publ. 470:201–203 (part), figs. 84, 123E; Vogt 1949, Ann. ent. Soc. Am. 42:197.

The holotype of *C. pseudacutipennis* is a female bearing the following labels: "Texas/America borealis, Coll. Obenberger/Typus" (red)/"Mus. Nat. Prague, Inv. 22929/Chrysobothris pseudacutipennis m. Type, Det. Dr. Obenberger." I have compared it with specimens under *C. acuminata* and *C. acutipennis* in the LeConte and Horn collections (MCZC), with material in the USNM examined by Fisher and with specimens in my collection. This species has been definitely known only from SE Texas, south of 28°30′N; however, I have

specimens from Brazos Co., College Station, which is approximately 30°27′N. Most of the specimens I have seen were collected on *Prosopis glandulosa* Torr. The only specimens I know from Mexico are: TAMAULIPAS, Cd. Victoria, 30-VIII-65, DSVC; SAN LUIS POTOSI, 41 mi N S.L.P., 26-VI-65, *Prosopis chilensis*; YUCATAN, Piste, VI to IX-68; QUINTANA ROO, "IIII"-66, all GHNC.

Obenberger's description of this species was unknown to Fisher at the time of his revision otherwise much of the confusion I discussed under *C. acutipennis* might have been averted. Obenberger appears to have considered Horn's entire treatment under *C. acutipennis* referable to *C. pseudacutipennis* and in large part I concur. For a detailed comparison with *acutipennis*, see under this species.

I examined the four specimens under *C. acutipennis* from the Horn Collection. The first is *C. pseudacutipennis*, 17.2 mm long and labeled "Tex./Horn Coll. H 10086/C. acutipennis Chev." Horn's description and figures undoubtedly were based on this specimen. His lower limit for length (.44″) and distributional reference to Mexico must have been taken from LeConte (1860); therefore, they probably refer to *C. acutipennis*. His locality listing of Arizona can be readily explained by the remaining three specimens which are *C. wickhami* Fisher from Yuma, the type locality for that species!

***Chrysobothris rossi* Van Dyke 1942:117.** SONORA, 30 mi S Navojoa, 29-VI-82, CDAE; Caborca, 30-VI-76, CIAN.

Chrysobothris rotundicollis Gory and Laporte

Chrysobothris rotundicollis Gory and Laporte 1837, Hist. Nat. icon. insectes Coleopt. 2:51, pl. 9, fig. 69; Barr and Westcott 1976, Pan-Pacif. Ent. 52: 150–151.

Chrysobothris blanchardi Horn 1886, Trans. Am. ent. Soc. 13:93–94, figs. 115–119. **New synonymy.**

Chrysobothris columbiana Barr 1969, Proc. ent. Soc. Wash. 71:131–132, figs. 7, 14. **New synonymy.**

Barr and Westcott (1976) removed *C. rotundicollis* from synonymy under *C. dentipes* (Germar) and related it to *C. lata* Kerremans (herein synonymized with *C. cribraria*), probably interpreting a geographical association from the type localities which they cited as "Santo Domingo" and "Florida," respectively. I compared the female lectotype (missing apex of last visible sternite) and male paralectotype (here designated; bearing no other label) of *C. rotundicollis* (both MNHN) with the lectotype and three paralectotypes of *C. blanchardi* (all MCZC), including the male genitalia, and found them to be conspecific. The types of the former measure 12.6 by 5.1 mm and 10.0 by 3.8 mm, respectively.

The type locality of *C. rotundicollis* is not "Santo Domingo," but "S. Domingue" (given as "Saint-Domingue" in the original description). According to Descarpentries (in litt.) he wrote this label exactly as it appears on a calligraphic label fixed to the boxes of Count Mniszech, the former owner of the Gory and Laporte types, who ordered that the original handwriting of the authors be destroyed. It is possible that the locality refers instead to "St. Dominique," which name I found applied to two localities in southern Quebec. This seems a more plausible locality as, although the species is widespread (occurring as far west as Arizona, with the southern record a single specimen from central Florida), most specimens are from northern regions. It is here recorded for the first time from NORTH CAROLINA, McDowell Co., 27-V to 10-VI-77, SGWS,

SIVC; and NEW HAMPSHIRE, Newton, 4/5-VII-46, DENH, GHNC. It is an uncommonly collected species and its introduction into the Caribbean region seems unlikely; however, a host genus, *Pinus,* occurs there.

Barr (1969) placed *C. columbiana* next to *C. blanchardi,* though stated that it keyed to *C. trinervia* (Kirby) in Fisher (1942). However, in his description the front margin of the prosternum is described ". . . with a broad, feebly developed, median lobe." On this basis it should key to *C. blanchardi.* Since the description of the Pacific Northwestern *C. columbiana,* the known range of *C. rotundicollis* (as *C. blanchardi*) has been expanded westward to Alberta (Bright 1987) and SE British Columbia (Barr 1971), the latter based on a specimen which ". . . can, perhaps, more properly be assigned to . . . *columbiana* Barr." I have seen specimens from MONTANA, Carter Co., 5 mi W Alzada, L. funnel in Pine, 20/VI–31/VIII-89, MTEC; WYOMING, Crook Co., Devils Tower Nat. Mon., 4,000′, 15-VII-83, and have seen a specimen from Pullman, Washington (WSUC); each has a well developed median lobe on the prosternal margin. Comparison of a male paratype of *C. columbiana* with these and several other specimens determined as *C. blanchardi* leaves me with no doubt that they are the same taxon. According to Fisher, this species ranges in length from 10.0–13.5 mm. I have examined two females, one which is 15.4 mm long, labeled from St. George, Utah (which is impossible unless it came from imported firewood!), but with the added label stating "probably from Seegmuller Mt., Mohave Co., Arizona," BYUC; and one 15.0 mm from Saskatchewan, SGWC. The range of *C. rotundicollis* in Arizona is thus extended 255 km to the northwest.

***Chrysobothris scitula* Gory 1840:160.** ALABAMA, Elmore Co., hwy. 231, 6.2 mi S jct. hwy. 14, 4-VI-89, RHTC.

Chrysobothris semisculpta LeConte

Chrysobothris semisculpta LeConte 1860, Trans. Am. phil. Soc., n.s. (1859) 11:254–255.

Chrysobothris burkei Chamberlin 1929, Pan-Pacif. Ent. 5:110–111, figs. 2, 3. **New synonymy.**

This is a widespread and variable species which is known from Washington and Idaho to southern California. I have examined 347 specimens determined as *C. semisculpta* from throughout this range except Idaho, mostly from California. Conversely, *C. burkei* has been recorded only from the type locality; the male holotype (CASC #5500) is labeled: "14586a4 9-22-19/Type" (red)/ "From Coll. of W. J. Chamberlin/TYPE Chrysobothris burkei Chamb. W. J. Chamberlin" (red). The specimen (CASC #5501) labeled "15331 Hopk. U.S./ Big Basin San Mateo Co Cal/Type" (red)/"Chamb" (green)/"From coll. of W. J. Chamberlin/ALLOTYPE Chrysobothris burkei Chamb. W. J. Chamberlin" (red) is also a male! Actually, Big Basin is in Santa Cruz Co. I have examined 27 specimens determined as this species from Alameda, Santa Clara and Santa Cruz counties.

Chamberlin (1929) compared his species to *C. semisculpta* (as *C. contigua* LeConte) and *C. cuprascens* LeConte; however, in Fisher (1942) the only possible clue to the affinity of *C. burkei* is its placement in the key. In my opinion, all of the characters except two used by Chamberlin to differentiate *C. burkei* correspond to the variability exhibited by *C. semisculpta* throughout its range. Of these two—female apical emargination of last visible sternite and male protibial tooth—Chamberlin placed particular emphasis on the latter, which

appears to be longer, more acuminate and situated at about the apical one-quarter of the tibia. The female apical emargination is broad and deep; in *C. semisculpta* it is usually narrower and shallower.

Based on the foregoing, most California specimens from Santa Barbara Co. southward fit the *burkei* phenotype (I have not seen specimens from intermediate areas). In fact, Chamberlin labeled a specimen from "Big Bear, Cal." as a cotype (CASC; invalid designation). Conversely, according to Barr (1971), Chamberlin labeled a paratype from Oregon (OSUC; invalid designation).

All males examined from the South Bay counties of California exhibited a very well-developed, rather acuminate protibial tooth. In southern California populations, this character is much more variable, though usually less narrowly acute and sometimes approaching the shape found in specimens from the Sierra Nevada and northward. Interestingly, 13 specimens from North Bay Area counties (Napa, Sonoma) have the protibial tooth as in the eastern and northern populations of *C. semisculpta,* while the female apical emargination more closely matches that of the *burkei* phenotype.

Relative position of the protibial tooth was determined from dividing the distance between the tibial and tooth apices by the length of the tibia. Results were as follows: South Bay Area counties ("*burkei*")—n = 8, r = .22–.26, $\bar{x}$ = .24; Napa and Sonoma cos.—n = 5, r = .28–.32, $\bar{x}$ = .30; southern California—n = 50, r = .22–.30, $\bar{x}$ = .26; southern Sierra Nevada north to Sierra Co.—n = 56, r = .26–.35, $\bar{x}$ = .29; Plumas Co. to Siskiyou and Modoc cos.—n = 39, r = .26–.33, $\bar{x}$ = .29; Oregon and Washington—n = 28, r = .25–.33, $\bar{x}$ = .29. This character seems to distinguish two groups. However, I think it is of little significance by itself, as the results of measurement are strongly, if not totally, reflective of the variable shape of the protibial dilation, the most acute of which are often directed forward.

Chrysobothris burkei is not worthy of species status, but a case might be made for it as a subspecies. First, however, a more detailed study of the *semisculpta*-group needs to be made, especially of specimens from distributional gaps, not only between *C. burkei* and *C. semisculpta,* but between the latter and *C. cuprascens* which is a species Fisher considered questionably distinct.

***Chrysobothris subcylindrica* Menetries 1859:182.** Apparently there has been no specific record of this species occurring in Washington, as listings of it from that state (under *C. deleta* LeConte) have been shown to refer to other species. This is surprising, as it has been collected in large numbers adjacent to the Columbia River in Oregon (Barr and Westcott 1976). These authors discussed the known larval hosts, all of which are in the Asteraceae. An additional composite host is *CHRYSOPSIS VILLOSA* (Pursh) Nutt. ex DC, based on mature larvae taken during V-80 in the same area (ODAC). WASHINGTON, Walla Walla Co., McNary Nat. Wildlife Ref., 26-VI-70, SGWC.

Chrysobothris texana LeConte

Chrysobothris texana LeConte 1860, Trans. Am. philos. Soc. (N.S.) (1859), 11: 234.

Chrysobothris texana: Dominguez-Rubio 1969, Boln. tec. Inst. nac. Invest. for. Mex. 30:17. Misidentification.

This widespread western United States species was recorded from Mexico (Veracruz, Jalapa) by Dominguez-Rubio based on a single specimen which she described in detail. She compared it only with Fisher's (1942) redescription,

giving but two differences, and stating: "Todas las demas caracteristicas son iguales, lo mismo que los genitales." I examined this specimen and it is not *texana,* nor does it appear to be closely related. Unfortunately it is badly discolored from boiling in KOH to extract the genitalia. *Chysobothris texana* is primarily a Great Basin–Rocky Mountains species, with *Juniperus* spp. as hosts, and its occurrence anywhere in southeastern Mexico seems highly improbable. It has not otherwise been recorded from that country; however, specimens are at hand from BAJA CALIFORNIA N., Sierra Juarez, .6 mi S El Condor, 6-VII-75; 6.4 mi N Valle de Trinidad, 4-VII-75, RLWE.

***Chrysobothris trinervia* (Kirby) 1837:157.** ARIZONIA, Coconino Co., Grand Canyon N. P., 4 mi N North Rim, 25-VII-79, RLWE. Fisher (1942) recorded this species from California, but in my opinion its occurrence in that state is to be doubted. I have examined hundreds of specimens of the genus from that state, as have several others who have collected extensively there, and it has not been seen. Neither have I seen it from southern Oregon nor Nevada.

***Chrysobothris vulcanica* LeConte 1861:346.** MONTANA, Ravalli Co., Sula, 3-VIII-29, on *Pseudotsuga menziesii,* GHNC. Bright (1987) included California in the range for this species; however, no specimens are known from that state and I doubt it will be found there. It has been recorded from British Columbia though not from Vancouver Island, from which I have seen a specimen bearing no definite locality or date (SGWC). This species (Fig. 7) is rare in collections and no host or habitat data have been recorded. The known distribution indicates a more northerly distribution than for most species in this group, which are known from coniferous habitats and appear restricted to those trees as hosts. Most collectors look for adults on downed timber, especially slash and log piles, where many species can be taken in considerable numbers—but often not without considerable effort! Any deviation from this general habit by a species could account in large part for its apparent rarity (*cf., C. orono*).

On 4&5-VII-79 I collected 15 male and 4 female *C. vulcanica* in Oregon, Wallowa Co., NWSec. 28, T2N, R44E, 1,400 m. This site had been selectively cut recently, and numerous slash and logs were present on the ground. However, all but one beetle (taken as it lit on the soil) were collected from young Douglas fir, *Pseudotsuga menziesii* (Mirb.) Franco, which were bent over due to logging activities and/or snow. The trees were leaning at angles from about 15° to 45°, ranged in size from approximately 6.5–13 cm d.b.h., and were all or in large part exposed to full sun. Most had only a few branches, two bore none. Some had been scraped by logging equipment, but more often exhibited damage from exposure to the sun. The latter scalds the trunk and cracks the bark, which appears to be what attracts *C. vulcanica.* Females were observed probing these areas with their ovipositors. Borings seen in trunks show that the larvae mine extensively beneath the bark in these wounded areas, the end result being extensive scarring of the tree. Several old and new adult emergence holes were observed. Numerous trees of other coniferous species in a similar condition, plus cut and upright (or nearly so) wounded Douglas fir, were examined at the site and only species of *Chrysobothris* were noted. Elsewhere, *Chrysobothris* spp., notably *C. monticola* Fall and *C. sylvania* Fall, have been observed on such trees as harbored *C. vulcanica,* but not with the consistency exhibited by the latter at the Wallowa Co. site. However, on VIII-82, at 1,220 m in the Palouse Range near Moscow, Latah Co., Idaho, I found several *C. vulcanica* on damaged upright trees or cut stumps of Douglas fir (approximately .3 m diameter) which were exuding much pitch.

Barr (1971) gave the length of *C. vulcanica* as 15–19 mm, whereas those I

examined ranged from 13.5–17.5 mm. The lower limit of size could cause problems in identification based on existing keys to species.

***Chrysobothris woodgatei* Champlain and Knull 1922:144.** This species (Fig. 9) is rarely collected, having been recorded from only four mountainous localities in the north of Arizona, New Mexico and Colorado; and in extreme southwestern Utah. Northward extensions are now documented by two specimens from Utah, Rich Co., Limber Pine [summit above Logan Canyon, 2,380 m], 23-VI-85 and WYOMING, Natrona Co., Casper Mt., 7,200′, 1-VII-75, both RLWE. The only clue to its habits was provided by Tanner (1928, as *C. quadrilineata* LeConte—see Barr and Westcott 1976): "Taken around *Pinus ponderosa* on the East trail." I collected two specimens of *C. woodgatei* as they lit on pieces of dead pine twigs on the ground at Pt. Imperial, Grand Canyon, Arizona. According to R. J. Lavigne (in litt.), the Casper Mt., Wyoming, site is a sandstone outcrop above shortgrass prairie, with a clump of *Pinus flexilis,* some *Populus tremuloides* and *Juniperus scopulorum,* and an understory of short grass, *Allium* sp., *Arenaria* sp., *Musineon* sp. and *Sedum* sp.; furthermore, "The fauna on this mountain has some peculiar elements in it."

Acknowledgments

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INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE

The following appeared in the *Bulletin of Zoological Nomenclature,* vol. 47(1).

Opinion 1577. *Hydrobius* Leach, 1815 (Insecta, Coleoptera): *Dytiscus fuscipes* Linnaeus, 1758 conserved as type species, and *Berosus* Leach, 1817 (Insecta, Coleoptera): conserved.

The Coleopterists Bulletin, 44(3):344–348. 1990.

LASIODERMA HAEMORRHOIDALE (ILL.) NOW ESTABLISHED IN CALIFORNIA, WITH BIOLOGICAL DATA ON *LASIODERMA* SPECIES (COLEOPTERA: ANOBIIDAE)

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Abstract

Lasioderma haemorrhoidale (Illiger) is recorded from Santa Clara and Fresno counties, California; these are the first records for this species, which is native to the Mediterranean region. The species is redescribed, a modified key to North American species of *Lasioderma* is provided, and the beetle and male genitalia are illustrated. Host data are given for *L. haemorrhoidale* and, if known, for other world species of *Lasioderma.*

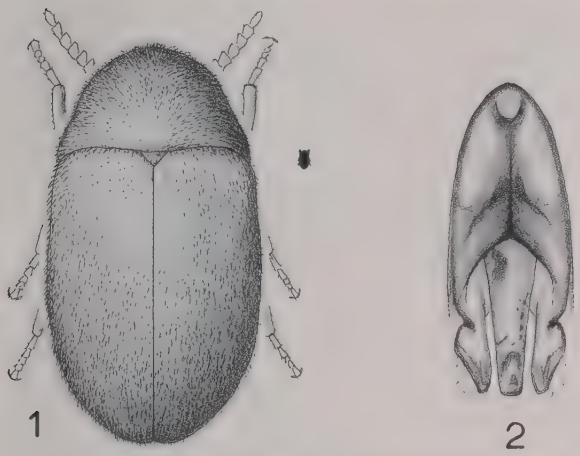
The 16 specimens of *Lasioderma haemorrhoidale* (Illiger), upon which this new record for the United States is based, were collected in Santa Clara and Fresno counties, California, in 1981, 1982, and 1983. Most specimens are recorded from thistle (*Cirsium* sp.). In its native habitat, the species exhibits a circum-Mediterranean distribution, having been found from coastal Yugoslavia and Greece to Spain, Corsica, Cyprus, Syria, Egypt, Tunisia, and Algeria. The species is not known to be injurious. The addition of *L. haemorrhoidale* brings to five the number of species of *Lasioderma* in North America.

Most species of *Lasioderma* in North America are not economically important; however, the closely allied cigarette beetle, *L. serricorne* (F.), is a serious pest of dried stored tobacco, and other materials. The original host of *L. serricorne* was evidently thistle, thus, some time in the past, it underwent an alteration of its feeding preference and became a pest.

Lasioderma haemorrhoidale is now in a new habitat and it is possible that it could, similarly, adapt to feeding in materials other than thistle and become a pest. It is therefore important that means for its identification be presented, so the adult is here redescribed, illustrated, and worked into a key to the North American species of *Lasioderma.*

There are more than 50 world species belonging to the genus *Lasioderma,* but the feeding preferences of only <12 of these are known. These reports on the feeding habits of the species are widely scattered, and there has never been a summary of these habits published. To fill this gap I here bring together the published notes on the species of *Lasioderma.*

The following redescription is offered because no English description is available for this species.



Figs. 1–2. *Lasioderma haemorrhoidale.* 1, adult, dorsal view; small figure equals actual size. 2, aedeagus.

Lasioderma haemorrhoidale (Illiger)
(Figs. 1, 2)

Redescription. *General:* Length 2.3–2.7 mm. Body 1.9–2.0 times as long as wide. Body in dorsal outline weakly convex. Pubescence of dorsum fine, pale yellow-orange, with a weak luster, moderate in density, bristling. Dorsum orange-brown to red-brown; pronotum often clouded with dark brown; ventral surface and head sometimes red-brown throughout, often clouded with dark brown, ranging to dark brown or black nearly throughout; antennae and legs orange-brown to red-brown. Dorsal surface weakly shiny. Punctation of dorsal surface fine, dense, of 1 size.

Head: Eyes separated by 2.2–2.5 times vertical diameter of an eye. Punctures of front less dense than those of pronotum, separated by more than diameter of a puncture. Last segment of maxillary palpus elongated and pointed, about 3 times as long as wide, broadest medially.

Dorsal surface: Pronotum with discal punctures fine and dense, separated on an average by less than diameter of a puncture; punctures at sides a little larger and denser than those on disc; surface at each side weakly, nearly evenly convex. Elytra with discal punctation similar to that of pronotum.

Ventral surface: Metasternum with a strong, sinuate carina bordering anterior declivity; carina usually complete, may be incomplete laterally; with no second carina; median metasternal process with a notch and groove. Abdominal punctures on first segment small, dense, separated on an average by less than diameter of a puncture; middle of 2nd segment with about 10–12 punctures from front to back.

Aedeagus (Fig. 2): Basal lobe broadest basally, tapering apically with sides nearly straight; internal processes occurring at base and apex with smaller processes medially. Each lateral lobe constricted basally, broadest medially, and tapering apically; apical palp-like appendage broad.

Collection and Identification Data. Ten of the 16 specimens known to have been collected in California are deposited in the U.S. National Museum of Natural History collection; the others have been returned to the collectors. Mr. E. J. Ford was the first to have collected this species in California; 3 of the 5 specimens are in the USNM. The collection data are: "San Jose Calif., 7/27/81; Collector E. J. Ford," "Santa Cruz Mtns. Calif., 8/5/81; Cirsium sp.;

Collector E. J. Ford." A series of 10 specimens (5 in USNM) have the data "Blackbird Valley off San Antonio Road NE Mt. Hamilton, Santa Clara Co., CA, Coll. I VII 1982, S. Rosenthal, R. Pemberton, C. Turner; Cirsium campylon; reared from head emerged 19 ." Data submitted with the Ford specimens states "Breeds in pithy portion of dry flower heads. Seeds apparently not eaten." The last specimen bears the following data "CAL. Fresno Co., Fresno, 10-IX-1983, W. H. Tyson."

My identification of the above specimens as *haemorrhoidale* is based upon good agreement of the specimens with 16 other specimens in the USNM that were identified as this species, and which are from the Anastase Alfieri collection. All of these specimens were collected in Egypt.

A single specimen in the USNM provides a clue as to the possible means of introduction of this species into North America. There is a specimen of *haemorrhoidale* (my original identification states "*Lasioderma haemorrhoidale* Illig. or very nr., det. R. White, '79) with the following label data "Los Angeles Cal. VIII-18-31; In Quarantine from Rhodes Italy; Collected from seed; Cal. Dept. Agr. No. 31901."

Biology of *Lasioderma* Species

The best-known member of this genus is the cigarette beetle, *L. serricorne* (F.), a cosmopolitan species that is a pest of numerous stored materials in addition to tobacco. Although the cigarette beetle does great damage to harvested and manufactured tobacco, it is also injurious to a wide variety of dried stored products, such as seeds, cacao, spices, dried fruits, and materials of animal origin (such as wool, silk). It has been found in the capitulum of various Carduaceae (Normand 1936:146), suggesting that this could be the original host of the species.

The more than 50 world species of the genus *Lasioderma* are widely distributed, but more than half of them are found in the Palaearctic region. Nothing is known about the biology of most of these species. See Table 1 for a summary of the known biological habits of the world species of *Lasioderma.*

Thistles are the most frequent hosts of these species. Plants of the genera *Centaurea, Cirsium, Echinops, Scolymus,* and *Silybum* are thistles; plants of the genera *Carlina* and *Cynara* are thistle-like in form; all of these are members of the family Compositae. The *Euphorbia* are spurges (Euphorbiaceae); *Sambucus* are elders (Valerianaceae); *Tamarix* are shrubs or trees (Pinaceae); *Phelipaea* are rapes (Orobanchaceae). Plants of the genus *Prosopis* are mesquites and relatives (Leguminosae). *Pyracantha* are ornamental shrubs (Rosaceae); *Schinus* are peppertrees (Anacardiaceae); *Moringa* are tropical trees (Moringaceae); *Fraxinus* are ashes (Oleaceae).

Key to North American Species of *Lasioderma*

The key below is a modification of that in Fall (1905:204) and has been altered to accommodate *haemorrhoidale.*

1. Metasternum with two transverse carinae, a distinct one bordering anterior declivity, a weaker one behind declivity, latter carina may be incomplete medially 2
– Metasternum with a single distinct transverse carina, bordering anterior declivity 3
2(1). Body bicolored, elytra significantly darker than remainder; length 1.3–1.6 mm; Ohio and New Jersey to Florida ..... *semirufum* Fall

Table 1. Biology of *Lasioderma* species.

Species	Hosts or habits	Distribution	Reference
baudii Sch.	Hosts–*Cynara cardunculus* L., *Carlina corymbosa* L.	S. Europe, N. Africa	Prota 1959
bubalum (Fairm.)	From dry stalks of *Silybum marianum* Gärtn.	Europe, Japan	Peyerimhoff 1926
bubalum (Fairm.)	Ex ripe fruit of *Prosopis farcta*		Halperin & Español 1979
b. phelipaearum Peyer.	From scape of *Phelipaea violacea* Desf.	N. Africa	Peyerimhoff 1926
festai Pic	From *Scolymus grandiflorus* Desf.	N. Africa	Peyerimhoff 1926
festai Pic	From capitulum of *Echinops*		Normand 1936
haemorrhoidale (Ill.)	In dried capitulum of thistles	Africa, Europe	Normand 1936
haemorrhoidale (Ill.)	In ripe fruit of *Prosopis farcta*		Halperin & Español 1979
haemorrhoidale (Ill.)	Reared from *Cirsium campylon*		recorded herein
latitans Woll.	From *Euphorbia dendroides* L.	Canary Isl.	Peyerimhoff 1926
mulsanti Sch.	From *Euphorbia*	Spain, Algeria	Normand 1936
obscurum Solsky	From *Sambucus* flowers	Europe, Asia	Obenberger 1916
punctulatum Reitter	From ripe fruits of *Prosopis farcta*; ex dry branch of *Pyracantha* sp.; ex ripe fruits of *Schinus molle* L.; from dry branch of *Moringa peregrina*; ex dry branch of *Fraxinus syriaca* Boiss.	Syria	Halperin & Español 1979
redtenbacheri Bach.	From capitulum of thistles, hosts–*Centaurea scabiosa* L., reared from *C. jacea* L.	Europe, Asia	Normand 1936 Cymorek 1967
semirufulum Reitt.	From dead branches of *Tamarix africana* Poir.; *T. gallica* L.	Corsica	Peyerimhoff 1926
s. vacaresiense Chob.	Beaten from *Tamarix gallica* L.	France	Chobaut 1924
serricorne (F.)	In addition to tobacco, damages a great variety of dried, stored materials primarily of plant but also of animal origin	Cosmopolitan	—
sulcicolle Chev.	From capitulum of *Centaurea sempervirens* L.	Algeria	Peyerimhoff 1926

– Body color uniform throughout; length 1.3–1.9 mm; eastern United States west to Texas and Oklahoma ..... *hemiptychoides* Fall

3(1). Very small, 1.5–1.7 mm long; eyes very small, separated by about 4 times vertical diameter of an eye; northeast United States ..... *falli* Pic

– Larger, 1.8–3.0 mm long; eyes larger, separated by 2.2–3.3 times vertical diameter of an eye 4

4(3). Body elongated, 1.9–2.0 times as long as wide (Fig. 1); length 2.3–2.7 mm; ventral surface usually significantly darker than remainder of body; California ..... *haemorrhoidale* (Ill.)

– Body less elongated, about 1.6–1.7 times as long as wide; length 1.8–3.0 mm; body same color throughout; throughout United States ..... *serricorne* (Fab.)

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ADDITIONAL NOTES ON THE BIOLOGY AND DISTRIBUTION OF BUPRESTIDAE (COLEOPTERA) IN NORTH AMERICA, PART III[1]

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Abstract

New biological and/or distributional data are given for 67 species of Buprestidae in the following genera: *Acmaeodera, Acmaeoderopsis, Actenodes, Agrilus, Anthaxia, Brachys, Buprestis, Chalcophora, Chrysobothris, Cypriacis, Descarpentriesina, Dicerca, Mastogenius, Pachyschelus, Paragrilus, Polycesta, Ptosima, Taphrocerus,* and *Texania.*

Biological and distributional data for 67 species of Buprestidae are presented in order to be available for the U.S. Department of Agriculture Catalog of Coleoptera (in prep.). Genera and species are arranged alphabetically for easy reference. The term *new larval host* refers to material that was "reared" or "cut" from the plant, or in one case the female was ovipositing in the plant, and *new adult host* refers to material that was collected on the plant. Abbreviations of collections [brackets] are as listed in Arnett and Samuelson (1986), except for T. C. MacRae [TCMC] and J. R. Heitzman [JRHC].

***Acmaeodera gibbula* LeConte.** ARIZONA: Yuma Co., 10 mi N Yuma, Mittry Lake, 1 mi NE Headgate, emerged ex small limbs *Salix gooddingii,* 7, 13-VII-85, wood collected, 8-IV-84, G. H. Nelson (recorded ex *Salix* sp. by Westcott *et al.* 1979). New larval host record.

***Acmaeodera mixta* LeConte.** KANSAS: Gray Co., 23-VI-87, sweeping rangeland; Kiowa Co., 13, 16-VI-87 on flowers *Ratibida columnifera,* all G. A. Salisbury [TCMC]. New state record.

***Acmaeodera tubulus* (Fabricius).** DELAWARE: New Castle Co., Blackbird, 12-V-88, J. Huether, on flowers *Cornus florida.* FLORIDA: Franklin Co., Carrabelle, 8-IV-87, on flowers *Conradina canescens* [CUIC]. New state and adult host records.

***Acmaeoderopsis junki* (Théry).** CALIFORNIA: San Bernardino Co., 25 mi W Baker, Hwy. 15, emerged ex *Prosopis glandulosa* var. *torreyana,* 3-VIII-87, wood collected, 2-VIII-84, G. H. Nelson. New Larval host record.

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[1] Part II was published in the Coleopterists Bulletin 41:57–65 (1987).

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***Actenodes acornis* (Say).** MISSOURI: Ste. Genevieve Co., Hawn State Park, emerged ex dead 1" diameter limb, *Carya glabra,* 5–22-VI-86, wood collected, 25-V-85 [TCMC & GHNC]; St. Louis Co., Ballwin, emerged ex dead *Acer saccharum,* 21-VI-88, wood collected, IX-86, all T. C. MacRae. New larval host records. WEST VIRGINIA: Kanawha Co., Guthrie, 7-VI-87, M. C. Thomas [PPCD]. New state record.

***Agrilus abductus* Horn.** LOUISIANA: Tangipahoa Parrish, 4 mi N Robert, 25-IV-81, E. G. Riley. OKLAHOMA: Latimer Co., III-V-86, K. Stephan [& GHNC]; Muskogee Co., Arkansas River, W of Webbers Falls, 15-V-79, W. D. Shepard, beach drift [& RLWE]. New state records.

***Agrilus acutipennis* Mannerheim.** MISSOURI: Montgomery Co., Graham Cave State Park., 21-V-86, T. C. MacRae, on *Amelanchier arborea.* New adult host record.

***Agrilus arcuatus fulgens* LeConte.** MICHIGAN: Ingham Co., Okemos, 28, 30-VI-81, S. G. Wellso [TCMC]. New state record.

***Agrilus arcuatus torquatus* LeConte.** OKLAHOMA: Latimer Co., VI-84, K. Stephan. New state record.

***Agrilus audax* Horn.** OKLAHOMA: Latimer Co., III-V-86, K. Stephan on *Quercus marilandica* [& GHNC]. New state and adult host records.

***Agrilus aurichalceus aurichalceus* Redtenbacher.** INDIANA: Elkhart Co., Elkhart, 25–29-V-85, W. B. Warner, [TCMC]. MAINE: York, 9-VII-37, B. G. Markos [DENH]. NEBRASKA: Cherry Co., Valentine Nat. Wildlife Ref., 9-VI-82 [CUIC]. Dawes Co., 29-VI-74, W. T. Morgan [Chadron St. College]; Scottsbluff, 19-VI-65, F. Snocker [GHNC]. WEST VIRGINIA: Fayette Co., near Octa Milepost 64-E, J. W. Amrine, Jr., lab reared from canes of *Rosa multiflora* [WVUC, GHNC]. New state records.

***Agrilus champlaini* Frost.** MISSOURI: Ste. Genevieve Co., Hawn State Park, along Pickle Creek, 22-I-89, cut from gall on live twig, *Ostrya virginiana,* T. C. MacRae. New state record.

***Agrilus concinnus* Horn.** KANSAS: Linn Co., 4 km N Pleasanton, 2-VIII-84, B. Danforth, R. Brooks, C. Michener [SEMC, TCMC, & GHNC]. New state record.

***Agrilus crataegi* Frost.** KANSAS: Crawford Co., 23-V-88, G. A. Salsbury, beating *Crataegus* [TCMC]. NEBRASKA: Jefferson Co., Fairbury, 21-VI-79, W. F. Rapp [CDAE]. OKLAHOMA: Latimer Co., V-84, VI-85, K. Stephan [& GHNC]. New state records.

***Agrilus crinicornis* Horn.** KANSAS: Cherokee Co., 12-V-88, G. A. Salsbury, sweeping undergrowth [TCMC]. New state record.

***Agrilus defectus* LeConte.** MISSOURI: Jefferson Co., Victoria Glades Natural Area, 22-V-86, T. C. MacRae, on *Carya tomentosa* [& GHNC]. New adult host record. WEST VIRGINIA: Kanawha Co., Camp Virgil, 9-V-86, M. C. Thomas [PPCD]. New state record.

***Agrilus diospyroides* Knull.** KANSAS: Crawford Co., 27-V-87, on *Diospyros virginiana,* G. A. Salsbury [TCMC]. New state record.

***Agrilus dozieri* Fisher.** GEORGIA: Ware Co., Cowhouse Road, 1.6 mi N Okefenokee Swamp Camp, 22-V-88, R. Turnbow. New state record.

***Agrilus egenus* Gory.** KANSAS: Barber Co., 7 mi W Medicine Lodge, 3-VI-75, G. H. Nelson; Comanche Co., 19-VI-86, G. A. Salsbury; Stafford Co., 25-VI-86, G. A. Salsbury, all on *Robinia pseudoacacia* [TCMC & GHNC]. New state record.

***Agrilus eleanorae* Fisher.** ARIZONA: Cochise Co., Huachuca Mts., Miller Cyn., 24, 26-VII-87, T. C. MacRae, on *Acacia* sp. [& GHNC]. New state record.

***Agrilus fallax* Say.** MISSOURI: Franklin Co., River Round Wildlife Area, emerged ex dead ¾" diameter branch, *Celtis tenuifolia,* 13-V-86, wood collected, 7-VIII-85, T. C. MacRae [& GHNC]. New larval host record.

***Agrilus geminatus* (Say).** WEST VIRGINIA: Charleston, 29-V-87, M. C. Thomas; Kanawha Co., Guthrie, 26, 27-IV-86, blacklite trap [PPCD & GHNC]. New state record.

***Agrilus gibbicollis* Fall.** KANSAS: Meade Co., 30-VI, 7-VII-86, G. A. Salsbury [TCMC & GHNC]. New state record.

***Agrilus granulatus granulatus* (Say).** ARIZONA: Canyon de Chelly Natl. Mon., 16-V-87, M. & B. Baehr. New state record.

***Agrilus imbellis* Crotch.** OKLAHOMA: Latimer Co., V-85, V-86, K. Stephan [& GHNC]. New state record.

***Agrilus obolinus* LeConte.** COLORADO: Larimer Co., 28-VII-80, D. Leatherman, on "net-leaf hackberry" [CSUC & GHNC]. New state record.

***Agrilus ohioensis* Knull.** MISSOURI: Ste. Genevieve Co., Hawn State Park, emerged ex dead branch, *Carpinus carolinia,* 15–23-V-88, wood collected, III-88, T. C. MacRae [& GHNC]. New state and larval host records.

***Agrilus olentangyi* Champlain & Knull.** MISSOURI: Jefferson Co., Victoria Glades Natural Area, 16-V-86, T. C. MacRae, on *Celtis tenuifolia.* New adult host record. ALABAMA: Madison Co., Monte Sano State Park, 27-V-84, N. M. Downie [& GHNC]. KANSAS: Clark Co., 10-V-86 & Cowley Co., G. A. Salisbury [TCMC & GHNC]. New state records.

***Agrilus otiosus* Say.** KANSAS: Cherokee Co., G. A. Salsbury, emerged ex dead *Sassafras albidum,* V-88 [TCMC]. MISSOURI: Jasper Co., Sarcoxi, T. C. MacRae, emerged ex pruned *Carya laciniosa,* 23-V, 11-VI-88, wood collected, VIII-87 [& GHNC]. New larval host records.

***Agrilus paracelti* Knull.** MISSOURI: Jefferson Co., Sunridge Tower Park, 13, 16-V, 2-VI-86, T. C. MacRae, on *Celtus tenuifolia* [& GHNC]. KANSAS: Barber Co., near Medicine Lodge, 2–21-VI-75, G. H. Nelson and 30-V-86, T. C. MacRae, all on *Celtis laevigata* var. *texana.* New adult host records.

***Agrilus parvus* E. Saunders.** MISSOURI: St. Charles Co., West Alton, 21-VII, J. M. Sullivan, feeding on foliage *Amorpha fruticosa* [TCMC & GHNC]. WYOMING: Platte Co., Laramie River, Wheatland, 16-VI-74 [ESUW]. New state records.

***Agrilus politus politus* (Say).** MEXICO, SONORA: Yecora, 21-VIII-86, B. Kondratieff [CSUC]. New record Mexico.

***Agrilus quadriimpressus* Ziegler.** MISSOURI: Montgomery Co., Graham Cave State Park, 21-V-86, T. C. MacRae, on *Quercus velutina*; Jefferson Co., Victoria Glades Natural Area, 22-V-86, T. C. MacRae, on *Carya tomentosa.* New adult host records.

***Agrilus transimpressus* Fall.** KANSAS: Barber Co., 5–7 mi W Medicine Lodge, 31-V-86, T. C. MacRae, on *Juglans nigra.* New state record.

***Agrilus vittaticollis* (Randall).** MISSOURI: Montgomery Co., Graham Cave State Park, 21-V-86, T. C. MacRae, on *Amelanchier arborea.* New state record.

***Agrilus walsinghami* Crotch.** COLORADO: Mesa Co., Colorado Natl. Monument, Ute Cyn., 29-VII-88, B. Kondratieff, Weissman, on *Salix* sp. [CSUC]; 15 mi WSW Delta, Escalante Cyn., 6,000′, 16-IX-75, U. Lanham [GHNC]. New state record.

***Anthaxia cyanella* Gory.** MISSOURI: Jefferson Co., Sunridge Tower Park, 22-V-86, T. C. MacRae, on *Prunus americana* & *Rhus aromatica*; Victoria Glades Natural Area, 13-V-86, T. C. MacRae, on *Ulmus rubra,* new adult host

records; St. Louis Co., I-270 rest stop, T. C. MacRae, emerged ex dead *Vitis* sp., 1–11-VI-88, wood collected, V-88 [& GHNC]. New larval host record.

***Anthaxia quercata* (Fabricius).** WEST VIRGINIA: Berkeley Co., Sleepy Creek Hunt Area, 25-VI-86, M. C. Thomas & T. Allen [PPCD]. New state record.

***Anthaxia viridifrons* Gory.** MISSOURI: Jefferson Co., Victoria Glades Natural Area, T. C. MacRae, emerged ex branch *Ulmus rubra,* 8, 15-V-88, branch collected, III-88 [& GHNC]. New larval host record.

***Brachys aerosus* (Melsheimer).** WEST VIRGINIA: Berkeley Co., Sleepy Creek Mt., 23-V, 19, 24-VI-86, T. Allen; Hampshire Co., Grace, 21-VII-76; Romney, 21-VII-76, W. Northeimer & K. Elrod; Hardy Co., Moorefield, 17-VIII-76, W. Northeimer; Pocahontas Co., Boyer 12-VIII-76, C. C. Coffman, all malaise trap [PPCD & GHNC]. New state record.

***Brachys aeruginosus* Gory.** KANSAS: Cherokee Co., 18-IV-88, G. A. Salsbury, on *Sassafras albidum* [TCMC]. MISSOURI: St. Francois Co., St. Francois State Park, 25-IV-86, T. C. MacRae, on *Quercus marilandica* [& GHNC]. New adult host records. WEST VIRGINIA: Hampshire Co., Grace, I-VI-76, W. Northeimer, malaise trap [PPCD]. New state record.

***Brachys ovatus* (Weber).** WEST VIRGINIA: Hampshire Co., Romney, 8-VI-76; Hardy Co., Moorefield, 2-VI-76, all W. Northeimer & K. Elrod, all malaise trap [PPCD & GHNC]. New state record.

***Buprestis confluenta* (Say).** MISSOURI: Jasper Co., 11-VI-64, W. R. Crow [UMRM]; Nodaway Co., Maryville, 3-X-70, M. Donisi [JRHC]. New state record.

***Buprestis decora* Fabricius.** MISSOURI: Dent Co., Salem, 18-IV-59, W. D. Buchanan [UMRM]. New state record.

***Buprestis salsburyensis* Herbst.** WEST VIRGINIA: Hampshire Co., 3 mi S Purgitsville, 13-V-69, J. M.; Morgan Co., Cacapon State Park, 9-V-85, G. W. Gibson [PPCD & GHNC]. New state record.

***Chalcophora liberta* (Germar).** MINNESOTA: Crow Co., Manhattan Beach, 19-VI-63, P. C. L. [TCMC]. New state record.

***Chrysobothris harrisi* (Hentz).** WEST VIRGINIA: Hampshire Co., Romney, 25-V-77, C. C. Coffman, malaise trap [PPCD]. New state record.

***Chrysobothris ignicollis* Horn.** KANSAS: Kiowa Co., 7-V-88, G. A. Salsbury [TCMC]. New state record.

***Chrysobothris neotexana* Dozier.** MISSOURI: Jefferson Co., Sunridge Tower Park, T. C. MacRae, emerged ex dead 3″ trunk of *Juniperus virginiana,* 5–10-VI-86, wood collected, 9-III-85 [& GHNC]. New state record.

***Chrysobothris sexsignata* (Say).** MISSOURI: Franklin Co., River Round Wildlife Area, T. C. MacRae, emerged ex dead twig *Carya glabra,* 13-V-86; Montgomery Co., Graham Cave State Park, T. C. MacRae, emerged ex dead branch *Amelanchier arborea,* 21–30-VI-88, wood collected, III-88 [& GHNC]. New larval host records.

***Cypriacis striata* Fabricius.** WEST VIRGINIA: Kanawha Co., Cross Lanes, 14-V-82, C. Oldham [PPCD]. New state record.

***Descarpentriesina cyanipes* (Say).** MISSISSIPPI: Washington Co., Delta Expt. Forest, 28/29-V-81, R. L. Penrose [RLWE]. WEST VIRGINIA: Monongalia Co., 17-VIII-07, F. Martin & N. Miller, black locust [PPCD]. New state record.

***Dicerca lepida* LeConte.** OKLAHOMA: Latimer Co., VI-84, K. Stephan. New state record.

***Dicerca lurida* (Fabricius).** MISSOURI: Jefferson Co., Valley View Glades

Natural Area, T. C. MacRae, emerged ex dead branch *Carya glabra,* 7, 28-IX-88, wood collected, III-87. New larval host record.

***Dicerca tenebrica* (Kirby).** MISSOURI: Mississippi Co., Big Oak Tree State Park, 13-VIII-65, R. Zack [UMRM]. New state record.

***Mastogenius crenulatus* Knull.** MISSOURI: Boone Co., Columbia, 12-V-84, D. Utt [TCMC]. New state record.

***Pachyschelus schwarzi* Kerremans.** MISSOURI: Jefferson Co., House Springs, T. C. MacRae, emerged ex leaves *Apios americana,* 12-V-86, leaves collected, 9-IX-85 [& GHNC]. New larval host and state records.

***Paragrilus tenuis* (LeConte).** MISSISSIPPI: Leflore Co., Greenwood, 13-VII-71, D. Brzoska [TCMC]. New state record.

***Polycesta arizonica* Schaeffer.** ARIZONA: Huachuca Mts., Copper Canyon, emerged from *Quercus emoryi,* 30-VI, 5-VII-87, wood collected, 26-VII-84, G. H. Nelson. New larval host record.

***Ptosima gibbicollis* (Say).** FLORIDA: Marion Co., Ocala, 17, 26-II-77, M. C. Thomas [FSCA]. WEST VIRGINIA: Berkeley Co., Sleepy Creek Hunt Area, 24-VI-86, M. C. Thomas & T. Allen; Kanawha Co., Coonskin Park, 25-V-87, M. C. Thomas [PPCD]. New state records.

***Taphrocerus agriloides* Crotch.** KANSAS: Cowley Co., 29-IV-86, G. A. Salsbury, on *Nemastylis geminiflora* [TCMC & GHNC]. New state and adult host records.

***Taphrocerus chevrolati* Obenberger.** COLORADO: Chatfield State Park, CL854, 6-VI-77, D. A. & J. T. Polhemus; St. Vrain Nuclear Power Site, 3-VII-72, J. W. Brewer, malaise trap [CSUC & GHNC]; Weld Co., Roggen, 2-VII-78, G. E. Bohart [EMUS]. KANSAS: Morton Co., 13-V-87. G. A. Salisbury [TCMC]. New state records.

***Taphrocerus cylindricollis* Kerremans.** MISSOURI: Vernon Co., Gay Feather Prairie, 8-V-87, T. C. MacRae. New state record.

***Taphrocerus howardi* Obenberger.** WEST VIRGINIA: Wood Co., Lubeck, 20-V-70, J. D. Hacker, oats [PPCD]. New state record.

***Taphrocerus nicolayi* Obenberger.** WEST VIRGINIA: Hampshire Co., Grace, 21-IX-76, C. C. Coffman; Hardy Co., Moorefield, 9-VI-76, W. Northeimer & K. Elrod, malaise trap [PPCD & GHNC]. New state record.

***Taphrocerus schaefferi* Nicolay & Weiss.** WEST VIRGINIA: Hampshire Co., Romney, 8-VI-76, W. Northeimer & K. Elrod; Hardy Co., Fisher, 17-VIII-76, W. Northeimer, all malaise trap [PPCD & GHNC]. New state record.

***Texania fulleri* (Horn).** Nothing has been recorded about the biology of this uncommon species. One female was collected while ovipositing at the base of the trunk of a standing dead *Celtis laevigata* in TEXAS: Bexar Co., Babcock Road and Scenic Loop, near San Antonio, 11-VII-86, G. H. Nelson. New larval host record.

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Winterbourn, M. J., and K. L. D. Gregson. 1989. **Guide to the aquatic insects of New Zealand.** Bull. Ent. Soc. New Zealand, No. 9, 95 pp.

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A list of 18 Dryopidae and 35 Elmidae species from the Iberian Peninsula and Baleares Islands.

Bily, S., and O. Mehl. 1989. **Longhorn beetles (Coleoptera, Cerambycidae) of Fennoscandia and Denmark.** Fauna Entomologica Scandinavica. Vol. 22, 203 pp, 9 colored plates.

Includes keys to subfamilies, genera, and species and includes 86 colored habitus illustrations. For each species a description, the distribution, and biology are included. A table at the end gives the distribution by province.

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TWO NEW SPECIES OF *EURYSTERNUS* DALMAN (COLEOPTERA: SCARABAEIDAE: SCARABAEINAE) FROM VENEZUELA WITH NOTES ON THE GENUS

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Abstract

Eurysternus sanbornei, n. sp., and *Eurysternus ventricosus*, n. sp., from Canaima National Park, Venezuela, are described and illustrated. Jessop's 1985 key to *Eurysternus* species is modified to accommodate these two new species and *E. vastiorum* Martínez. The distinctive defensive behavior of *Eurysternus* species is discussed with respect to possible outgroups.

The genus *Eurysternus* Dalman comprises a unique group of dung beetles restricted to Neotropical forests. Their distinctive morphology, which led to the erection of the tribe Eurysternini by Vulcano *et al.* in 1960, has recently been complemented by their peculiar behavioral patterns of nidification described by Halffter and coworkers (Halffter *et al.* 1980; Halffter and Edmonds 1982). Identification of species remained difficult until Jessop (1985) clarified the synonymy and produced an identification guide which included a key to all species in the genus. The only contribution since that time has been the descriptions of 6 new species by Martínez (1988). Described and illustrated below are two additional species discovered during recent field work in southeastern Venezuela. This is supplemented by observations on the defensive behavior of some species that may relate *Eurysternus* to a possible outgroup among the Australian fauna.

Eurysternus sanbornei Gill, **new species** (Figs. 1–7)

Holotype. Male, length 15.4 mm, greatest width 6.5 mm. Body and legs dark brown, mouthparts and antennae reddish-brown. Head (Fig. 1) coarsely punctate except along midline in anterior ⅓; each puncture bearing a short flattened seta; surface between punctures shagreened, shiny; clypeus strongly depressed along anterior median margin, lateral margin shallowly concave anterior to clypeogenal suture; ocular canthus reduced, dorsal surface of eye nearly obscured by pronotum. Pronotum (Fig. 1) unevenly convex, anterolateral regions depressed, posteriorly with pronounced median triangular depression; anterior angles broadly rounded; pronotal surface coarsely, densely punctate, each puncture (except those in posterior triangular depression) usually with an erect, stout, lanceolate seta (Fig. 2); setae along anterior lateral margins not noticeably longer than those on disc. Elytron with humeral region swollen (Fig. 3), humeral carina elongate, broadly rounded; lateral carina feebly indicated basally, carina absent from level of metacoxa to elytral apex; striae crenulate, intervals opaque with scattered setae, setae arranged in two single rows adjacent to margins of interval; sutural interval elevated in

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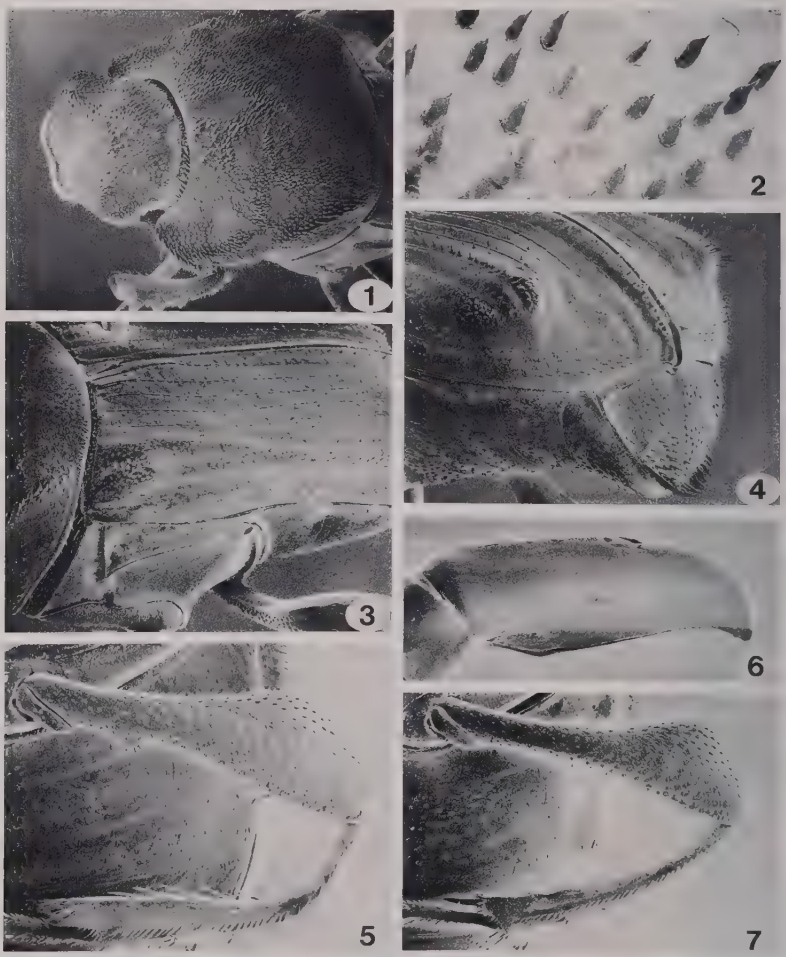
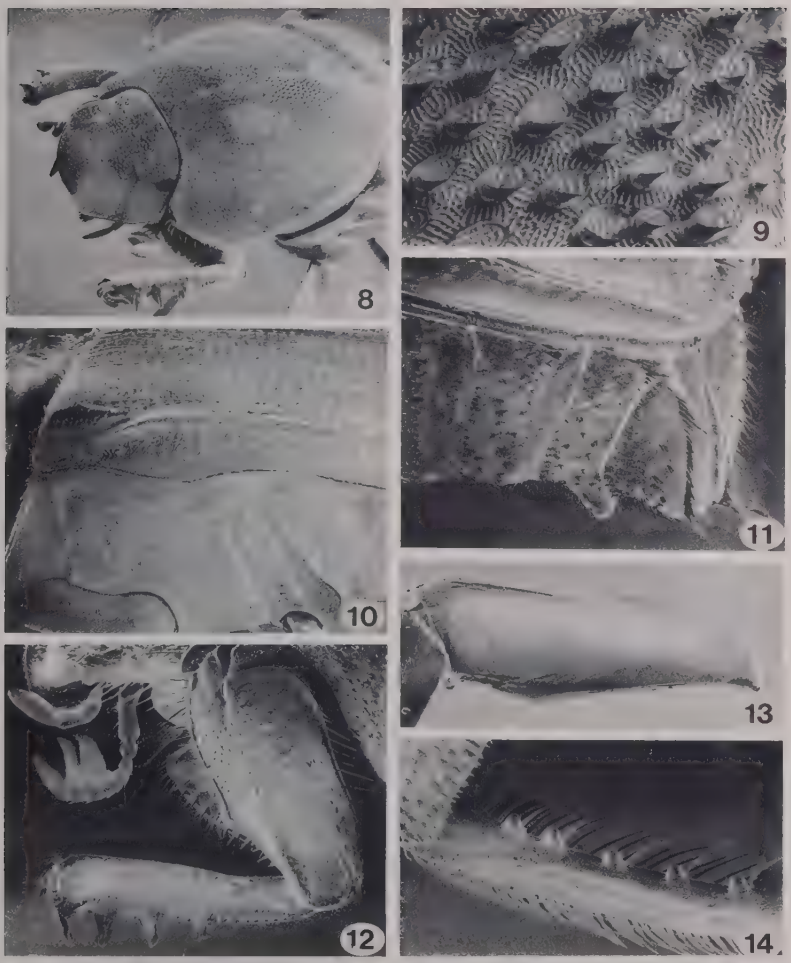


Figs. 1–7. *Eurysternus sanbornei,* n. sp. 1, head and pronotum. 2, pronotal setae. 3, left elytron, humeral view. 4, left elytron, apical view. 5, male hind leg. 6, male genitalia, lateral view. 7, female hind leg.

posterior ½, striae 5 and 6 terminating on elevated setose callus (Fig. 4). Pygidium (Fig. 4) coarsely setose-punctate, punctures more closely spaced apically; apex with fringe of long setae. Metasternum lacking round median fovea, laterally carinate, anteriorly with a shallow elongate median fovea; surface punctate, punctures larger and more widely spaced laterally. Metacoxae separated by about ⅔ length of trochanter. Abdominal sternites shiny, coarsely punctate, concave medially. Profemur coarsely, densely punctate on ventral surface; punctures bearing short, lanceolate setae. Protibia with apex rounded with dense patch of setae and tibial spur greatly reduced; tarsus absent. Meso- and metafemora shiny, moderately clavate, ventral surfaces setose-punctate; metafemur with spur on hind margin at basal ¼ (Fig. 5). Metatibia angulate at basal ⅓; apex forming elongate, fused spur. Genitalia (Fig. 6).



Figs. 8–14. *Eurysternus ventricosus,* n. sp. 8, head and pronotum. 9, pronotal setae. 10, left elytron, humeral view. 11, apical abdominal sternites, lateral view. 12, male fore leg. 13, male genitalia, lateral view. 14, male hind tibia, basal half.

ALLOTYPE. Female, length 14.0 mm, greatest width 5.8 mm. Similar to holotype except in following characters: abdominal sternites evenly convex; protibia with inner apical angle forming a sharp tooth, apical setae absent, tibial spur large; metafemur (Fig. 7) more strongly clavate; metatibia evenly arcuate, apex with articulating spur.

TYPE MATERIAL. Holotype, male, VENEZ[UELA]: Bolivar, 15 km E Kavanayen, 21–27.XII.1987, B. D. Gill. Allotype, female, VENEZ: Bolivar, 120 km S El Dorado, 20–27.XII.1987, B. D. Gill. Holotype and allotype deposited in the Facultad de Agronomia, Universidad Central de Venezuela, Maracay.

Paratypes: 9 males, 5 females. VENEZUELA, 2 males, same data as ho-

lotype; 1 male, same data as allotype; 1 male, Bolivar, 125 km S El Dorado, 18.VII–7.VIII.86, B. Gill, 1,100 m; 1 male, Bolivar, Km 40, Sta. Elena Icabaru Road, 4–6.VIII.86, B. Gill, 1,000 m; 2 males, 2 females, Bolivar, El Dorado Sta. Elena Km 131, 1,200 m, 30.X.72, J. & B. Bechyne; 1 male, same data except 1,300 m, 23.X.72; 1 male, 2 females, same data except 28.X.72; 1 female, Bolivar, Yuruani, 7.XI.72, J. & B. Bechyne.

Paratypes are in the following collections: Facultad de Agronomia, Universidad Central de Venezuela, Maracay; C. Bordón, Maracay; Canadian Museum of Nature (formerly the National Museum of Natural Sciences), Ottawa; H. & A. Howden, Ottawa; and B. D. Gill, Ottawa.

Remarks. The series of paratypes ranges in length from 12.0–15.4 mm, but otherwise shows very little variation. *Eurysternus sanbornei* will not key past couplet 1 in Jessop (1985) since it combines the elongate humeral carina characteristic of species-group I with the metasternal characters of species-group II. Jessop's key can be modified as follows to accommodate this new species:

1. Elytra with humeral carina elongate. Metasternum with or without median fovea 1a
– Elytra with humeral carina short. Metasternum without median fovea ..... (species-group II) 7
1a. Metasternum medially foveate. Lateral margin of elytron carinate in basal ¾ ..... (species-group I) 2
– Metasternum not medially foveate. Lateral margin of elytra not carinate beyond basal ¼ (anterior pronotal angles broadly rounded, protarsi absent, length 12.0–15.4 mm) ..... *sanbornei* Gill

Eurysternus sanbornei is similar in size and shape to *E. foedus* Guérin-Méneville with which it shares several distinctive characters such as the coarsely punctate head and pronotum, absence of protarsi, and clavate metafemora. However, the dense lanceolate setae of the pronotum, rounded pronotal angles and the unusual elytral carinae should serve to differentiate *E. sanbornei* from other species in the genus. Specimens were collected from pitfall traps baited with fresh human dung.

The unusual combination of characters exhibited by *E. sanbornei* does not allow it to be placed into either of the two species-groups proposed by Jessop (1985) though it falls within the nominate subgenus of *Eurysternus sensu* Martínez (1988). The absence of a well-defined lateral elytral carina in particular is atypical for eurysternine species (but normal for most scarabaeine genera) and indicates a plesiomorphic character state with respect to other members of the genus. The problem of a suitable outgroup for *Eurysternus* is discussed later.

Eurysternus ventricosus Gill, **new species**
(Figs. 8–14)

Holotype. Male, length 10.2 mm, greatest width 4.8 mm. Body and legs reddish-brown to black, mouthparts and antennae orange brown. Head (Fig. 8) finely punctate anteriorly, punctures becoming larger posteriorly, each puncture bearing a short flattened seta; surface between punctures shagreened; ocular canthus well developed, dorsal surface of eye constricted at posterior margin of canthus. Pronotum (Fig. 8) evenly convex except for slight triangular depression along middle of posterior margin; anterior angles obtusely rounded; lateral margins broadly rounded in apical ½ thence converging to rounded posterior angles, margin fringed with long setae; surface of pronotum (Fig. 9) closely and coarsely punctate, each puncture bearing a short lanceolate seta, surface between punc-

tures shagreened. Elytron with humeral carina short (Fig. 10), lateral carina strongly developed; elytral intervals strongly shagreened, each with one or two rows of short erect setae, setae becoming longer near apex on intervals 1, 5 and 7. Pygidium shagreened with scattered long setae on disc and fringe of longer setae at apex. Metasternum densely punctate between coxae; elongate sulcus present along anterior midline; shallow depression on each side of midline in posterior 1/3. Penultimate abdominal sternite with transverse median tubercle (Fig. 11). Profemur (Fig. 12) with carina extending along 2/3 length on midventral surface, second carina extending 1/2 length along posterior margin; anterior margin strongly angulate at apical 2/3, angle forming rounded tooth; tibia tridentate, constricted along internal margin over basal 1/3, apex broadly rounded with dense brush of short setae. Ventral surfaces of meso- and metafemora faintly shiny, strongly and closely punctured, punctures bearing short, broad setae; metafemur unarmed, gradually expanded to widest point near apical 1/3; metatibia evenly arcuate, inner margin with single row of black, peg-like tubercles (Fig. 14), apex with moveable spur. Genitalia (Fig. 13).

Allotype. Female, length 9.8 mm, greatest width 4.2 mm. Similar to holotype except in following characters: penultimate sternite lacking raised median tubercle; profemur with anterior margin less angulate, not forming distinct tooth, carina on midventral surface indistinct past midpoint; protibia with apex obliquely truncate, setal brush absent, spur and tibial teeth more strongly developed than in holotype; metatibia less arcuate, lacking row of elevated tubercles.

Type Material. Holotype, male, VENEZ[UELA]: Bolivar, 120 km S El Dorado, 20–27.XII.1987, B. D. Gill. Allotype, female, same data as holotype. Holotype and allotype deposited in the Facultad de Agronomia, Universidad Central de Venezuela, Maracay.

Paratypes: 8 males, 6 females. BRAZIL: 1 male, Amapa, Serra Lombard, Olemarque, 12.VIII.61, J. & B. Bechyne. VENEZUELA: 2 males, 4 females, same data as holotype; 1 male, 1 female, Bolivar, 105 km S El Dorado, 17.VII–7.VIII.86, B. Gill, 350 m; 1 male, Bolivar, 125 km S El Dorado, 18.VII–7.VIII.86, B. Gill, 1,100 m; 1 male, Bolivar, 135 km S El Dorado, 20.VII–7.VIII.86, B. Gill, 1,400 m; 1 male, Bolivar, Quebrada de Jaspe, 19–20.VII.86, B. Gill; 1 female, Bolivar, 12 km N Luepa, Gran Sabana, 1–11.VII.87, S. & J. Peck, cloudforest carrion traps, 1,500 m; 1 male, Km 107, El Dorado Santa Elena, 520 m, 16.VIII.57, F. Fernandez Y. & C. J. Rosales.

Paratypes are in the following collections: Facultad de Agronomia, Universidad Central de Venezuela, Maracay; C. Bordón, Maracay; Canadian Museum of Nature (formerly the National Museum of Natural Sciences), Ottawa; H. & A. Howden, Ottawa; and B. D. Gill, Ottawa.

Remarks. The series of paratypes ranges in length from 8 to 11 mm and like the preceding species shows little variation. Using Jessop (1985), *Eurysternus ventricosus* readily falls into species-group II and will key to the last couplet, number 19. Males and females of this new species can be separated from *E. cayennensis* Castelnau and *E. confusus* Jessop by the dense covering of uniformly short lanceolate setae on the pronotum, more closely punctate pronotum and metasternum, and the more rounded anterior pronotal angles. *Eurysternus ventricosus* is also very close to a female specimen from Tingo Maria, Peru, that agrees with Martínez's (1988) lengthy description of *E. vastiorum*. Both of these latter species share a double carina on the ventral surface of the profemur and an expanded inner margin of the protibia, but the elongate pronotal setae of *E. vastiorum* and the much more closely punctured metasternum of *E. ventricosus* should allow easy separation of these two species. These four species can be separated by the following modification to Jessop's key:

19. Profemur with 2 carinae on ventral surface, carinae extending from apex to at least midpoint of femur 20
– Profemur usually lacking carina(e), if present carina(e) never extending past midpoint of femur 21
20. Pronotum coarsely punctate, punctures nearly contiguous and each bearing a short lanceolate seta. Metasternum very closely setose-punctate. Male with median tubercle on penultimate abdominal sternite (length 8–11 mm) ..... *ventricosus* Gill
– Pronotum with coarse punctures separated by about 1 diameter, each puncture bearing an elongate recurved seta. Metasternum with widely-spaced setose punctures. Male abdominal sternites lacking tubercles (length 8–10 mm) ..... *vastiorum* Martínez
21. Male with short broad spur on hind margin of metafemur, and with spur on fore margin of profemur. Metafemur dark brown (length excluding head 8.3–9.8 mm) ..... *cayennensis* Castelnau
– Male lacking spur on hind margin of metafemur, and lacking spur on fore margin of profemur. Metafemur dark brown, or reddish-brown and gradually darker basally (length excluding head 6.9–8.7 mm) ..... *confusus* Jessop

As mentioned by Jessop (1985) and subsequently by Martínez (1988), females of *E. cayennensis* and *E. confusus* are almost impossible to separate apart from a slight (though generally consistent) difference in size. Males fortunately are reliably separated using the presence or absence of a spur on the hind margin of the metafemur. Males of *E. ventricosus* are readily distinguished from these and all other species by the presence of a tubercle on the penultimate abdominal sternite. The specific name *E. ventricosus* refers to this feature. Specimens were collected from dung-baited pitfall, flight interception, and carrion traps.

One additional change to Jessop's key in the form of a correction is noted below to facilitate the identification of *E. balachowskyi* Halffter and Halffter and *E. cyanescens* Balthasar, two species in which males lack articulating spurs on the metatibia.

15. Metafemur with spur on hind margin near apex. Male *without* moveable spur at tip of metatibia 16

Behavioral Notes and a Possible Outgroup

When clean, specimens of *Eurysternus* are easily recognized by their elongate, subrectangular habitus and the presence of an exposed scutellum. In the field, however, beetles are easily overlooked at dung due to their dull coloration, slow movements and their propensity when disturbed to feign death with the middle and hind legs extended. This cryptic behavior is often further enhanced by a layer of dung or soil that coats the body. The detailed cuticular microsculpture combined with coarse setose punctures in many species (Fig. 9 this paper and figures 61–64 in Jessop 1985) no doubt aid in the attachment of a camouflaging layer of soil. The two new species described above demonstrated these behaviors when collected at fresh bait in the field.

As a defensive strategy, these morphological and behavioral characteristics distinguish *Eurysternus* from other Neotropical scarabaeine genera although these are not restricted to the Eurysternini. Similar forms of thanatosis and camouflage have been reported by Matthews (1974) for the Australian genus *Amphistomus* Lansberge and by Krikken (1983) for African species of *Cyp-*

tochirus Lesne (cited as *Drepanocerus* Kirby). Such traits have undoubtedly arisen independently in the Oniticellini (*Cyptochirus, Drepanocerus* and related genera) and perhaps for species in other tribes whose behaviors have yet to be studied. The existence of a similar behavior in *Amphistomus,* however, may reflect something more than just convergence.

Gondawanan relationships between Neotropical and Australian Scarabaeinae have been suggested by Matthews (1974) for several genera of canthonines. A similar relationship may also exist between *Eurysternus* and one or several of the Australian genera such as *Aulacopris* or *Amphistomus.* Prior to the isolation of the Eurysternini by Vulcano *et al.* (1960), *Eurysternus* and *Amphistomus* were placed with the more distantly related *Sisyphus* in the Sisyphides. While a detailed morphological and anatomical character analysis is beyond the scope of the present paper, the use of ethological information such as defensive and nidification behaviors may prove helpful in elucidating the proper sister-group to the Eurysterini.

Acknowledgments

I would like to thank the Instituto Nacional de Parques, Caracas, for permission to work in Canaima National Park; Sr. Carlos Bordón of Maracay for his hospitality during field work in Venezuela; Dr. P. M. Sanborne and the Lyman Entomological Museum, Ste. Anne-de-Bellevue, QC, for field support in 1987; and Dr. H. F. Howden and Mr. L. E. C. Ling of Carleton University, Ottawa, ON, for their assistance and for providing the scanning electron micrographs.

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A NEW *DISONYCHA* FROM THE DOMINICAN REPUBLIC THAT IS A POSSIBLE PEST OF MELONS (COLEOPTERA: CHRYSOMELIDAE)

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Abstract

A new species of flea beetle, *Disonycha comma,* from the Dominican Republic is described and illustrated. It has been intercepted twice at Miami, Florida, and is a possible pest of melons. Two of the 35 North American species of *Disonycha* are currently recognized as pests. Characters are given which will allow separation of the new species from both the Caribbean and North American species of *Disonycha* which are most similar to it.

Adults of a species from the Dominican Republic belonging to the flea beetle genus *Disonycha* have been intercepted at least twice at Miami, Florida, on fruit of *Cucumis melo* L. (muskmelon, cantaloupe, honeydew, casaba). There is no evidence to indicate that the beetle is established in North America. Attempts to identify this beetle have not been successful, and I have established that the species is evidently not yet described. Because it has been collected on melon, it is a possible pest of this plant, so it becomes desirable to name the species and provide data to facilitate its identification.

Two of the 35 North American species of *Disonycha* are pests of some significance. Both adults and larvae of the spinach flea beetle, *D. xanthomelas* (Dalman), feed on foliage of the host plant. There are two generations per year of this beetle; the first one generally develops on weed hosts and the second one on spinach and beets; the beetle is also recorded from cabbage and wheat. The threespotted flea beetle, *D. triangularis* (Say), is also a pest of spinach, and in addition, is known from beets, *Amaranthus,* sorghum, corn, and wheat. Hosts of other species of *Disonycha* include *Polygonum, Amaranthus, Salix,* and *Solanum.*

Disonycha comma White, **new species**
(Figs. 1–3)

Description. *General*: Length 6.3–7.5 mm. Body length a little less than 2 times width; body mostly pale yellow, elytral markings black, pronotal, head, and tibial markings brown to black, tarsi brown to black. Dorsal body surfaces smooth and shiny.

Head: Pale yellow nearly throughout; apex of mandibles darkened; vertex with a median, elongated, brown to black spot that is variable in extent, usually widened anteriorly, spot may be feebly indicated. Interocular space a little less than 0.6× width of head; front with minute punctation only; tubercles weakly convex; carinae broad and broadly convex. Antenna about ⅗ as long as body; primarly brown to dark brown, basal 3 or 4 segments pale except narrowly dark medially.

Prothorax: Pronotum nearly 2 times as wide as long; surface smooth, without tubercles; at base and at sides with more or less evident, weak depressions; disc usually

Figs. 1–3. *Disonycha comma,* n. sp. 1, adult, dorsal view; black figure equals actual size. 2, aedeagus, lateral view. 3, aedeagus, dorsal view of apex.

with 5 brown to black spots (reduced in 3 of 15 specimens, absent in 1 specimen) with 1 spot elongated and longitudinal, nearly median and 2 spots at each side roughly comma-shaped; at side usually with a narrow, dark band. Scutellum light throughout (10 of 15 specimens); black throughout (4 specimens); or partly light, partly dark (1 specimen).

Elytra: Each elytron with black stripes as follows: a narrow sutural stripe extending from base to apex and a broad submedian stripe that is over 2 times as wide as sutural stripe extending from base to near apex, incurved anteriorly and posteriorly; sutural and submedian stripes narrowly joining at base; one specimen only with outer elytral margin black.

Ventral surface: Pale throughout except for portions of legs as follows: outer margins of tibiae narrowly to broadly brown to black, tarsi uniformly brown to black.

Aedeagus (Figs. 2, 3): In lateral view, moderately, nearly evenly arched, weakly recurved basally; thickest medially, weakly tapering basally and apically; apex blunt, dorsally behind it with a rounded protuberance; above orifice with a distinct, produced, nearly vertical process. In dorsal view, apex with a broad, evenly rounded lobe; process above orifice distinctly pointed; behind process with a broad, elongated depression; sides subparallel.

Collection Data. Thirteen specimens with following data: Taken at West Palm Beach, Fla., with *Cucumis melo* fruit. Inspectors R. L. Haymond, D. M. Lunsford; date "02-10-88." Origin–Dominican Republic. USDA lot 88 02501. Two additional paratypes with data: At Miami, Fla.; ex Dominican Republic; taken "2/24/88" by T. B. Washington; with *Cucumis melo* fruit. Holotype and all paratypes in U.S. National Museum of Natural History.

Remarks. Blake (1933:9) included a key to the species of *Disonycha* of America north of Mexico. *Disonycha comma* keys to couplet 19 and agrees better with the first part of the couplet (at which point *D. tenuicornis* keys out),

i.e., "Head entirely pale, antennae unusually long and slender, extending fully to the middle of the elytra in female" than with the second part of the couplet "Head with labrum and sometimes tubercles and occiput dark, antennae not usually long or slender and not extending to the middle of the elytra in female." The head of *D. comma* may be entirely light (2 of 15 specimens), but usually has a weak to distinct brown to black longitudinal marking on the vertex. *Disonycha tenuicornis* (known from New Mexico and Arizona) and *D. comma* are easily distinguished from one another. In *D. tenuicornis* the elytra vittae are narrow and sometimes weak to nearly absent (especially the sutural vitta); near the middle of each elytron the median vitta is about ⅓ to ⅙ as wide as is the space between the sutural and median vittae; the pronotal disc has 2 dark spots; the femoral apices are dark on the dorsal surface; and the tibiae are light throughout or with the inner margins darkened. *Disonycha comma* has the median elytral stripe always black, distinct, and broad; near the middle of each elytron the median vitta is about ⅔ as wide as is the space between the sutural and median vittae; the pronotal disk has 3–5 dark spots; the femora are light throughout; and the tibiae have the outer margin dark.

Based on the revision of the vittate species of *Disonycha* from the Americas south of the United States (Blake 1955), this species seems most similar to *D. spilotrachela* Blake, which is briefly discussed in a footnote (p. 4). *Disonycha spilotrachela* is from Cuba, Puerto Rico, and Haiti; the length is 4.3–5.3 mm; and each elytron bears 3 longitudinal stripes with the outermost one submarginal. *Disonycha comma* is 6.3–7.5 mm in length and each elytron bears 2 longitudinal dark stripes, and rarely (1 of 15 specimens) is there a third, marginal stripe.

The specific name refers to the comma-shaped markings of the pronotum.

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A NEW SPECIES OF *ARIANOPS* FROM CENTRAL ARKANSAS AND BIOGEOGRAPHIC IMPLICATIONS OF THE INTERIOR HIGHLANDS *ARIANOPS* SPECIES (COLEOPTERA: PSELAPHIDAE)[1]

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Abstract

Arianops copelandi Carlton, new species, is based on specimens from Pinnacle Mountain, Pulaski County, Arkansas. It is the third of a monophyletic group of species that occur in the Ouachita Mountains and Arkoma Basin Highlands. This trio represents a basal lineage within the *Arianops* phylogeny that was isolated from the main *Arianops* lineage in the southern Appalachians during the late Cretaceous subsidence of the Mississippi Embayment. The apparent absence of *Arianops* species from the Ozark Mountains is interpreted as evidence for the pre-Jurassic isolation of the Ozark Uplift from the Ouachita Mountains by the Arkoma Basin.

Arianops stephani Carlton and the male of *A. sandersoni* Barr were recently described from the Ouachita Mountains of eastern Oklahoma and Mt. Magazine in western Arkansas (Carlton and Allen 1989). We also reported the existence of a population of *Arianops* from Pinnacle Mountain, just west of Little Rock, Arkansas. Despite the suspicion that these Pinnacle Mountain specimens represented a third species of *Arianops* from the Interior Highlands, their status could not be determined with certainty because only females were represented in the series. Shortly after that paper was completed, two males were collected from Pinnacle Mountain and we were able to confirm that they represented an undescribed species.

That third species is described in this paper and its relationship to the two other Interior Highlands species is discussed. We also offer some ideas about the biogeographic significance of the Interior Highlands *Arianops* fauna that may have broad implications if corroborated by data from other soil arthropod taxa.

Barr (1974) gave a comprehensive treatment of the taxonomy and bionomics of the 30 *Arianops* species of the southern Appalachian Mountains and adjacent

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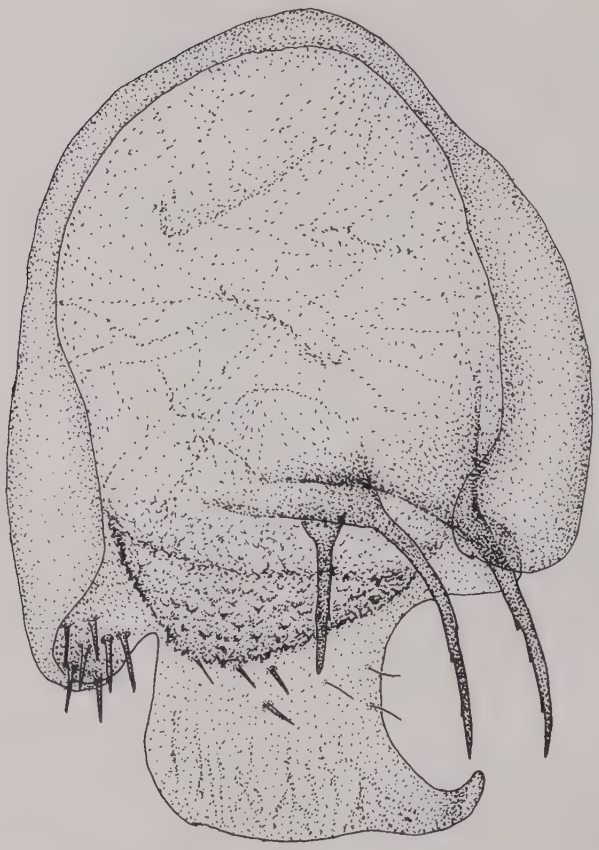

Fig. 1. *Arianops copelandi.* Aedeagus, dorsal aspect.

regions. This paper is essentially a followup to the one by Carlton and Allen (1989).

Arianops copelandi Carlton, **new species**
(Fig. 1)

ETYMOLOGY. Patronymic after Dr. Thomas Copeland, collector of the first specimen of the type series.

TYPE MATERIAL. Holotype male, USA, Arkansas, Pulaski County, Pinnacle Mountain State Park, northeast slope of Pinnacle Mountain near summit, hand-collected in leaf litter, 15 April 1988, C. E. Carlton. Type deposition, Field Museum of Natural History, Chicago, IL.

Paratypes. One male, three females, locality same as holotype. Male, hand-collected in leaf litter, 15 April 1988, C. E. Carlton (University of Arkansas Collection); one female, berlese sample, 8 December 1977, T. P. Copeland

(Donald S. Chandler Collection); two females, berlese samples, 22 October, 11 November 1987, C. E. Carlton (University of Arkansas Collection).

Male. Measurements: head 0.61 mm long, 0.55 mm wide; pronotum 0.58 mm long, 0.55 mm wide; elytra 0.65 mm long, 0.85 mm wide; median lengths of abdominal tergites 1–5 respectively 0.30, 0.13, 0.10, 0.72, 0.15 mm. Total length 2.90 mm. Color uniform dark reddish-brown.

Head: Lateral vertexal carinae prominent, extending from lateral angles of antennal tubercles to a point even with anterior margins of vertexal foveae. Median occipital carina absent. Vertexal foveae moderate, nude, located in shallow longitudinal depressions that merge into a shallow frontal depression. Antennal foveae absent. Interantennal and midfrontal ridges absent. Clypeus weakly reflexed along anterior margin. Labrum with one pair of small lateral, but no median, teeth. Lateral carinae from clypeus to ocular spines prominent. Ocular spine large, acute, oriented 45° anterolaterally. Mentum toothed. Antennomere IX slightly expanded on ventral face, subequal in size to X.

Pronotum: Basomedian foveoid depression well-defined, slightly elongate-ovate, flanked by a pair of low, acute spines. Three pairs of basolateral foveae present.

Elytra: Basal margin of each elytron carinate. Basal depressions absent.

Legs: Mesotrochanters simple. Femora clavate. Legs unmodified.

Abdomen: Tergite 1 with basolateral carinae in basal 1/5, lateral margins becoming obsolete near posterior margin. Tergite 5 abruptly declivous at apex, declivity bearing a deep, slightly transverse-oval, nude cavity surrounded by sparse pubescence. Posterior margin of sternite 4 bearing a small, porrect median spine. Sternite 6 broadly concave except near lateral margins, no specialized tufts of pubescence present.

Aedeagus (Fig. 1): Approximately as long as wide. Internal aspect of left phallobase wall bearing eight stout spinules. Apical shelf about 1/2 as wide as phallobase at base, broadly curved to right. Right apical angle turned dorsally, thumb-shaped. Apical shelf bearing three or four stout spinules in left half. Phallobase with three narrow, weakly serrate spines; right and median spines subequal, weakly arcuate; left spine shortest, straight. Internal sac studded with nipple-shaped tubercles.

Female. Tergite 5 weakly declivous and with only slightest indication of a median, apical foveoid depression. Sternite 4 lacking median spine. Sternite 6 slightly concave medially, otherwise unmodified. Other characters as described for male.

Material Examined. See Type Material.

Discussion. The external appearance of *A. copelandi* is almost identical to that of *A. stephani* from eastern Oklahoma (see Carlton and Allen 1989). The degree of development and relative positions of the major aedeagal styli are similar in the two species as well, but the apical shelf is much less developed in *A. copelandi*. Both species are smaller and more conservative in form than *A. sandersoni*, particularly in the relative development of aedeagal components and vertexal carinae.

Biogeographic Implications

It is useful to preface this section with the observations and assumptions upon which the following hypothetical discussion is based. We have attempted to incorporate some of Noonan's (1988) ideas about the relative reliability of vagile and sedentary organisms in biogeographic reconstructions. Noonan (1988) suggested that organisms that are highly sedentary throughout their life cycles are more reliable for elucidating biogeographic histories than those having a high potential for dispersal. This appears to be a reasonable approach to selecting data for biogeographic analysis so long as it is applied equally to potentially falsifying and corroborating data.

Species of *Arianops* are known only from the northern Ouachita Mountains of the Interior Highlands and the southern Appalachian Mountains. Other

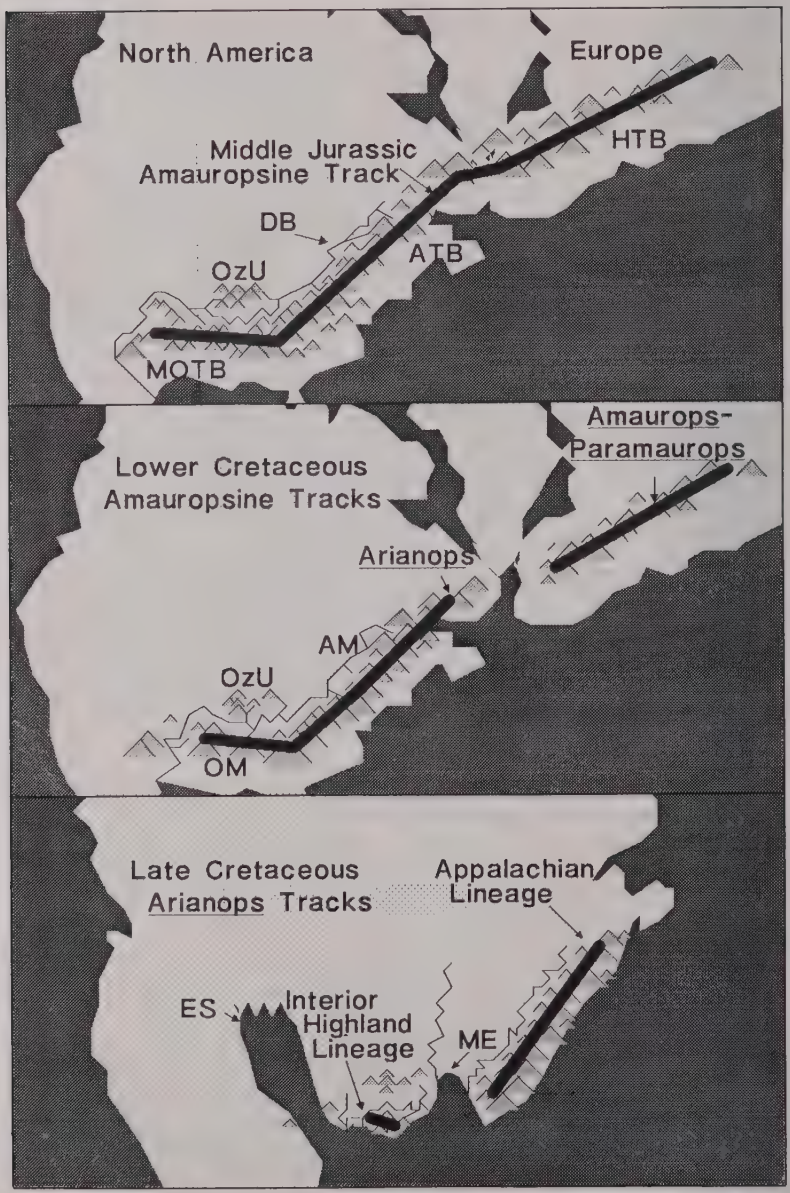

Fig. 2. Hypothetical sequence of events isolating ancestral lineages of Amauropsini. AM, Appalachian Mountains; ATB, Appalachian Thrust Belt; DB, hypothetical drainage basin; ES, epicontinental seaway; HTB, Hercynian Thrust Belt; ME, Mississippi Embayment; MOTB, Marathon-Ouachita Thrust Belt; OM, Ouachita Mountains; OzU, Ozark Uplift.

genera of the tribe Amauropsini (to which *Arianops* belongs) are restricted to southern Europe. All amauropsines have narrow ecological ranges, either living in rocky soil in high-relief habitats or in caves (Barr 1974; Jeannel 1948). Furthermore, all known amauropsines are eyeless and wingless. Dispersal potential for members of the tribe must therefore be extremely low, and this assumption is reinforced by the extreme localization of many species (21 of the total 33 species of *Arianops* are known only from the type localities).

With these considerations in mind, we formulated a hypothesis to explain the known distribution of *Arianops* species in terms of the regional geological history of the southeastern United States. It is clear that the three Ouachita species of *Arianops* form a monophyletic lineage within or near the *A. amplyoponica* group, as suggested in a previous paper (Carlton and Allen 1989), and a preliminary cladistic analysis of the genus (unpubl. data) places the Ouachita lineage at or very near the base of the generic phylogeny. From a cladistic biogeographer's perspective, this presents an interesting puzzle. It provides convincing evidence for an ancestral biotic link between the southern Appalachian Mountains and Ouachita Mountains within the Ouachita Thrust Belt (which includes Mt. Magazine).

The ancient divergence of the Ouachita Mountain lineage of *Arianops* may be illustrated as a three-step sequence of events (Fig. 2). The common amauropsine ancester may be represented by a generalized track extending throughout the ancestral North American-European thrust belts of Laurasia. The initial isolation of the ancestral *Arianops* lineage in the Ouachita-Appalachian Thrust Belt from other Laurasian amauropsines in the Hercynian Thrust Belt resulted from the isolation of the montane habitats between western Europe and northeastern North America. This began in early to mid-Cretaceous after a mid-Jurassic episode of minor rifting and culminated in late Cretaceous (see Burke 1976; and Ziegler *et al.* 1983). *Arianops* evolved in a broad distribution along the Ouachita-Appalachian Thrust Belt, but was isolated from the Ozarks by the Arkoma Basin, which may have served as a major drainage basin for both mountain ranges. The Ouachita Mountain *Arianops* lineage was subsequently isolated by the formation of the Mississippi Embayment. Subsidence of the Mississippi Embayment and invasion of a shallow sea breached the Ouachita-Appalachian Mountain Belt during late Cretaceous time (Ervin and McGinnis 1975) and isolated the high-relief regions of the Ouachitas and Appalachians (Ziegler *et al.* 1985). The shallow sea retreated by mid-Tertiary time leaving a very broad, low-relief plain traversed by south flowing rivers posing a barrier to *Arianops*. The ancestral distribution of the Ouachita Mountain *Arianops* was dissected and reduced by erosional activity and climatic fluctuations during the Tertiary, leaving the three described species and perhaps other undescribed species in perilous geographic isolation.

An alternate explanation to the late Cretaceous isolation of *Arianops* in the Ouachita region might propose continuity of the range of *Arianops* from the Ouachitas, through the Ozarks and central low plateaus to the Appalachian Plateau prior to Pleistocene glaciation. No *Arianops* species are known from north of the Ouachita Mountains in the high-relief and karst terrain of the Ozark Highlands. This region is similar in geologic and climatic history to the Appalachian Plateau, where *Arianops* species have been widely collected (Barr 1974). The assumption that *Arianops* once occurred in the Ozarks but became extinct is not a testable explanation. A testable hypothesis to explain the apparent absence of *Arianops* from the Ozark Highlands may be stated as follows: The Arkoma Basin, through which the Arkansas River now flows, has existed

as a corridor of low topographic relief between the Ouachita and Ozark Mountains from a period that predates the evolution of the ancestral amauropsine lineage. Barr (1974) notes that the French Broad River Valley (a considerably smaller feature than the Arkansas River Valley) demarks the boundary between largely allopatric *Arianops* groups in the southern Appalachians. The Arkansas River Valley (30 to 60 km wide) of the Arkoma Basin may be a formidable barrier to blind, flightless *Arianops* inhabiting the high-relief areas of the frontal Ouachitas.

The Arkoma Basin formed during the late Paleozoic assemblage of Pangea as a foreland basin associated with the Ouachita Thrust Belt (Morris 1974; Wickham *et al.* 1976). This structural trough would certainly have served as a drainage route for a large portion of the North American component of Pangea (probably draining to the west until subsidence of the Mississippi Embayment). Recent paleogeographic reconstructions of mid-Cretaceous North America (Ziegler *et al.* 1985) suggest that relief in the Interior Highlands was similar to present and that the Arkoma Basin separated the Ouachitas and Ozarks as low land. Owing to a relatively high content of easily eroded shale, the basin was likely maintained as a topographic low and was a drainage route through Mesozoic and Cenozoic time.

This time frame and sequence of isolating events are consistent with those suggested by Jeannel (1948), who postulated an early Tertiary origin for the two European lineages (*Amaurops* Fairmaire and *Paramaurops* Jeannel series) along either side of the Transaegean trough. Barr (1974) and Jeannel (1948) supported the idea that the *Arianops* lineage diverged from the basal amauropsine lineage prior to the divergence of the two Palaearctic series.

Two major predictions may be made on the basis of this hypothesis: (1) additional *Arianops* species may be discovered in the Ouachita, Arkoma Basin, and Arbuckle Highlands, but none will be found in the Ozarks; and (2) additional organisms that fit Noonan's (1988) criteria for maximum reliability in biogeographic reconstruction should have distributions that reflect the same historical patterns of isolation.

Although our knowledge of the distributions and cladistic relationships of arthropods, especially soil inhabiting forms, is poorly developed, several examples may be suggested to support this hypothesis, especially the long-term isolation of the Ouachita and Ozark Highlands, which is likely to be the most criticized component of the hypothesis. The monotypic pselaphid genus *Ouachitychus* Chandler (1988) is known from two localities south of the Arkansas River, Mt. Magazine in the Arkoma Basin, and Polk County, Arkansas, in the central Ouachitas. Two undescribed species of the carabid genus *Anillinus* Casey are recorded from several localities south of the Arkansas River. One is quite common and widely distributed in moist, rocky forest litter, yet it has not been found in the Ozarks. A third, aberrant species of *Anillinus,* also undescribed, occurs at a single locality in the Ozarks (Stone County, Arkansas) (Thomas C. Barr, Jr., pers. comm.). A cladistic analysis of these three species and related species in the southern Appalachians and California would provide an interesting test of our hypothesis.

In summary, this hypothesis proposes that the Ozark Highlands were isolated from the Ouachita Highlands prior to the breakup of the Appalachian-Ouachita-Marathon Mountain range, and that the latest high-relief connection between the Ouachita Mountains and the southern Appalachian Mountains was broken when the Mississippi Embayment formed during the late Cretaceous. Several lines of investigation have the potential to falsify or seriously

weaken this hypothesis. The discovery that *Arianops* species or other supposed Ouachita endemics with comparatively limited potential for dispersal also occur in the Ozarks would effectively falsify the pattern of isolation suggested, as would a sister taxon cladistic relationship between the Ozark and Ouachita *Anillinus* species. Convincing geological evidence for a more recent topographic connection between the Ouachita Mountains and the southern Appalachians would cast doubt on the time frame being suggested.

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SCIENTIFIC NOTE

A Case of Gynandromorphy in *Megasoma elephas occidentalis* Bolívar, Jiménez and Martínez (Coleoptera: Melolonthidae)

During four years (1986–89) of systematic collecting at Acahuizotla, Guerrero, México, we obtained an annual average of 50 specimens of *Megasoma elephas occidentalis* Bolívar, Jiménez and Martínez. At the end of this period (2-XI-1989) a specimen was collected with characters revealing it to be a gynandromorph.

This subspecies presents distinct sexual dimorphic characters, with the males exhibiting a long bifid cephalic horn with a pubescent projection at its base; pronotum humpbacked in the middle with the anterior corners laterally produced; pronotum, elytra, pygidium, and abdominal sternites densely pubescent; pygidium very convex; last abdominal sternite emarginate at apex; and prolegs long and slender. In contrast, the females have a small cephalic tubercle, pronotum smooth and shining, elytra smooth on basal fourth, pygidium and abdominal sternites slightly pubescent, pygidium concave on apical half, last abdominal sternite rounded, and prolegs short and wide.

The gynandromorph (Figs. 1, 2) has a length of 70.5 mm from the apex of the clypeus to the apex of pygidium, and in the general external morphology it shows female characters. Nevertheless, in dorsal view, the right half of the body exhibits some incipient male characters, such as the presence of sparse patches of setae on the head and pronotum; the cephalic tubercle well developed, but deformed and situated to the right; and the right elytron is 1.9 mm longer and 1.0 mm wider at base than the left one. Also, the entire abdomen presents male characters, with the external genitalia and copulatory structures of the internal sac well sclerotized and the reproductive apparatus well developed. The legs exhibit female features, except at the apex of the left metatibia, which presents dentitions on the edge similar to those of the male. On the other hand, minor teratologies are found, for example, the trisinuated right margin of the pronotum and the pygidium has a concavity extending to the apex on the right side and the posterior border is irregular. The specimen is deposited in the collection of J. Blackaller-Bages.

The gynandromorphy is a little known phenomenon in Melolonthidae: Lachaume (1983) reported one case in *Goliathus goliathus* (L.), Dechambre (1987) described another

Figs. 1, 2. *Megasoma elephas occidentalis,* dorsal and ventral views.

in *Megasoma elephas elephas* (Fabr.) and Ratcliffe (1989) did the same with *Golofa tersander* Burm. In the first two cases a bilateral gynandromorphism is presented, but in the last one the external morphology is of a male, whereas the genitalia is of a female. These types are quite different from that found by us; our specimen shows mostly female characters externally, whereas the entire abdomen and the reproductive apparatus, as well as some incipient characters mainly on the dorsal right side, show as male characters.

It seems to be that the origin of this phenomenon is due basically to disorders in the genetic mechanisms (Crowson 1981), however, these aspects are little understood, so that the discovery of these kinds of sexual mosaics will help in the future to reinforce a possible hypothesis.

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A NEW SPECIES OF *AGRILUS* REARED FROM MISTLETOE IN TEXAS (COLEOPTERA: BUPRESTIDAE)

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Abstract

Agrilus turnbowi Nelson, n. sp., is described from a series reared from dead mistletoe, *Phoradendron tomentosum,* attached to live *Prosopis glandulosa* in San Antonio, Texas.

A new species of *Agrilus* was reared from dead mistletoe, *Phoradendron tomentosum,* attached to living *Prosopis glandulosa* collected in Fort Sam Houston, San Antonio, Texas. It is described here, thereby making the name available for the Catalog of Coleoptera of North America (in prep.). Measurements were made with the use of an ocular grid: the length from the front of the head to the tip of the abdomen and the width at the humeri. Codens for collections are as listed in Arnett and Samuelson (1986). Dr. Henry Hespenheide, Los Angeles, California, concurs that this species is different from any known from Mexico.

My thanks go to Mr. Richard Westcott, Salem, Oregon, for reviewing the manuscript and making helpful suggestions, and to Ms. Annette Lee for typing the manuscript.

Agrilus turnbowi Nelson, **new species**
(Fig. 1)

Description. *Holotype male.* Form elongate, moderately slender and slightly flattened above; front of head dull greenish-blue, antennae aeneous with greenish tint; vertex of head and pronotum moderately shining, cupreous; elytra brownish-black with aeneous tint and with irregular pubescent design; ventrally shining, cupreo-aeneous, darker anteriorly; legs aeneous, anterior femora with bluish tint on medial surface.

Head with front feebly convex and slight depression on upper part between eyes; surface finely shagreened with some large punctures on lower front and epistoma, each puncture with a moderately short, semirecumbent, coarse, whitish seta; slightly arcuate transverse carina between antennal sockets; surface of epistoma excavated; antennae short, reaching to middle of pronotum when laid alongside, strongly serrate from fourth antennomere.

Pronotum 1.23× wider than long; basal margin angulate; lateral margins subparallel posteriorly, then slightly expanded to subparallel in middle ⅓ and then arcuately converging to narrowest at anterior angles; viewed laterally, marginal carina gently sinuate, submarginal carina straight anteriorly, sinuate posteriorly, the two widely separated anteriorly and narrowly separated posteriorly; anterior margin bisinuate with moderate arcuate median lobe; posterior margin angulately emarginate on either side, with median lobe truncate and feebly arcuately emarginate anterior to scutellum; disk convex with depressions as follows: median depression that is broadest and deepest posteriorly, then shallowest just before middle and then slightly deeper in anterior ⅓ and prominent broad lateral depression extending from near posterior angles to anterior ⅓; surface moderately rugose with some fine punctures, rugosities transverse at middle and curving anterolaterally; semirecumbent whitish setae confined to lateral regions, especially lateral depres-

sion; prehumeral carina lacking. Scutellum transversely carinate; surface shagreened, glabrous.

Elytra as wide as pronotum, widest at base; lateral margins sinuate near base, then feebly constricted to just before middle, then weakly expanded to just past middle, gently converging to separately, broadly rounded and feebly serrulate apices; sides of abdomen exposed above; disk of elytra moderately flattened, with obsolete carinae along lateral margins of flattened area; with broad, rather deep basal depressions, surface fairly densely imbricate-punctate, with appressed, yellow-white pubescent designs as follows: basal triangular area on basal fourth; broad oblique patch from there extending posterolaterally to just past middle that continues as dense spot on visible part of first abdominal segment; and irregular oblique patch at apical third extending posterolaterally from near suture to lateral margin.

Ventrally, anterior margin of prosternum with truncately rounded median lobe strongly declivous; prosternal process broad, sides parallel to behind procoxal cavities, then sharply angulated to blunt apex; prosternal surface reticulate-granulate-punctate medially, finely punctate laterally, sparsely clothed with short, appressed whitish setae; mesosternum finely, densely punctate laterally with moderately dense, short, appressed whitish setae; metasternum with small punctures dense anteriorly becoming sparser laterally and posteriorly, whitish setae very small and sparse; metacoxae rather densely granulate-punctate laterally; abdomen finely punctate, punctures sparse laterally where they are transversely joined by fine raised lines and posteriorly, punctures dense in midline anteriorly on sternite 1, and as larger spot laterally on sternite 3 and smaller one on sternite 4; general pubescence of sparse white hair-like setae, spots of flattened yellow-white setae laterally on sternites 3 and 4; sternite 1 faintly concavely flattened in midline; suture between sternites 1 and 2 obliterated; sternites 2–4 convex; sternite 5 flattened, with weak midline sulcus, broadly rounded apex, and with deep sulcus along apical and lateral margins that involves sternites 1–4 also; submarginal ridge of sternite 5 strong, with apex truncately rounded, and disk with large punctures bearing long hair-like setae. Tibiae straight; pro- and mesotibiae slightly dilated proximally, each with apical spur; metatibia with fringe of black bristles along posterior margin in apical half; tarsi same length on all legs, much shorter than tibiae; claws of pro- and mesotarsi with inner tooth almost as long as outer tooth, inner tooth of metatarsi much shorter than outer tooth, inner teeth not turned inward. Male genitalia (Fig. 1). Length 5.63 mm; width 1.35 mm.

Allotype female. Differs from male as follows: slightly more robust, front of head golden cupreous as is profemur; antennae shorter, not extending past anterior third of pronotum when laid alongside; abdominal sternite 1 only feebly flattened, and sternite 5 without midline impression; each tarsal claw on all feet with inner tooth considerably shorter than outer tooth. Length 6.30 mm; width 1.65 mm.

ETYMOLOGY. The specific name honors Dr. Robert H. Turnbow, Jr., who reared the type series and has extended many kindnesses over the years.

TYPE MATERIAL. Described from 17 ♂♂ and 10 ♀♀, all from TEXAS: Bexar Co., San Antonio, Ft. Sam Houston, emerged from dead *Phoradendron tomentosum* attached to live *Prosopis glandulosa.* Holotype ♂, allotype ♀ (USNM), 1 ♂ and 1 ♀ paratype, emerged 31-V to 3-VI-88; 8 other paratypes emerged between 17–18-XI-87 and 5–8-VIII-88, all R. H. Turnbow; 9 ♂♂ and 6 ♀♀ emerged between 21-II-90 and 12-III-90 from the same host collected at the type locality by S. G. Wellso, 14-XII-89. Paratypes in the following collections: BKDC, CASC, CHAH, FMNH, GCWC, GHNC, GVMC, RLWE, SGWC, TAMC, WFBC, and R. H. Turnbow, Jr.

VARIATION. The males vary from 5.40–6.00 mm ($\bar{x}$ = 5.68 mm, n = 8) in length, the females from 5.85–6.53 mm ($\bar{x}$ = 6.21 mm, n = 4). In color there is very little variation. In males the slight longitudinal impression on the midline of the first abdominal sternite is as the type in 2 specimens, faint in 2, and lacking in 3. The longitudinal midline sulcus on sternite 5 of the male is faint in 6 specimens, and in 1 there is a transverse impression, which is possibly a

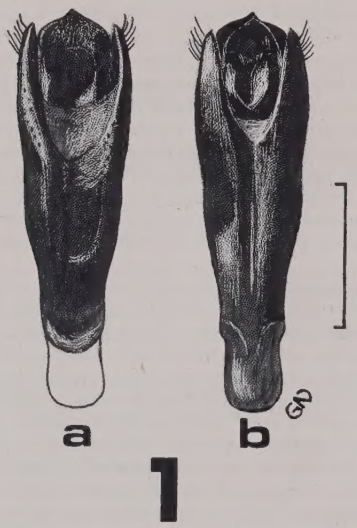

Fig. 1. *Agrilus turnbowi* Nelson, male genitalia, (a) dorsal, (b) ventral (line = 0.5 mm).

developmental anomaly. The suture between abdominal sternites 1 and 2, while completely obliterated in the holotype, is faintly indicated in the midline and laterally in 6 males, fairly distinct in 1, and in 3 females it is faintly indicated laterally. Sternite 1 is faintly flattened in 2 females and convex in 1.

BIOLOGY. The entire type series was reared from dead mistletoe, *Phoradendron tomentosum,* attached to living *Prosopis glandulosa* that was also infested with the scolytid, *Pseudothysanoes phoradendri* Blackman, the cerambycid, *Neoclytus augusti* Chevrolat, and the clerid *Cymatodera b. balteata* LeConte.

COMPARISONS. Apparently, this species is not closely related to any other species from the United States. It will key to *Agrilus cavatus* Chevrolat in Fisher (1928); however, it is quite different from that species in many ways, being much smaller with weaker pronotal midline impression, and the pubescent patterns on the elytra are very different, those of *A. cavatus* being confined to small spots. I know of no Mexican species with which it can be confused.

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WANTED: Loan of staphylinid genera *Staphylinus* and *Platydracus* from Mexico, Central and South America and the West Indies, for inclusion in revision of New World species. A. F. Newton, Division of Insects, Field Museum of Natural History, Chicago, IL 60605, U.S.A.

PLEOCOMA: Correspondence with active "Pleocomaniacs" (if any?) requested to exchange recent field data, localities, and general information. Contacts from N. Calif., Oregon and Washington especially desired. Delbert A. La Rue, 3894 McKenzie St., Riverside, CA 92503, U.S.A.

FREE: Aquatic Beetles—Duplicates from F. N. Young Collection—*Free* to school collections or museums. Write F. N. Young, Dept. Biology, Indiana University, Bloomington, IN 47405, U.S.A.

WANTED: One specimen of Australian carabid *Hyperion shroetteri* Schreibers. Purchase or exchange (New England Carabidae or other Coleoptera). William L. Krinsky, Div. of Entomol., Peabody Museum, Yale Univ., New Haven, CT 06511, U.S.A.

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